UNIVERSITY OF PENNSYLVANIA

SEASONAL VARIATIONS IN EMPLOYMENT IN MANUFACTURING INDUSTRIES

A STATISTICAL STUDY
BASED ON CENSUS DATA

J. PARKER BURSK

A THESIS

IN ECONOMICS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
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PREFACE

In recent years, the continually recurring problems of unemployment have compelled economists, statesmen, and students to analyze and measure the fluctuations in the volume of employment. For the most part, the studies which have been made have emphasized the most conspicuous variations, those which result from the cyclical irregularities in general business conditions and relatively little attention has been devoted to the numerous employment fluctuations which are repeated annually. Seasonal variations in employment are such familiar phenomena that they have been greatly neglected. Some studies of seasonality have been made for the construction industries and the garment trades, but these have been principally qualitative rather than quantitative. Apart from the measurement of seasonal variations, for the purpose of eliminating them as disturbing factors in analyses of cyclical fluctuations, quantitative measures are largely lacking.

This neglect of quantitative measurements cannot be attributed solely to a paucity of data. The Census of Manufactures offers monthly employment figures for all manufacturing industries for the Census years. Although continuously reported data would be more satisfactory, these intermittent reports offer a body of material which is most valuable for the measurement of seasonality in employment.

The purpose of the study presented here is twofold: first, to determine the presence or absence of seasonal variations in employment for the more important manufacturing industries reported by the Census; and second, to offer quantitative measures of seasonality showing the time and the amount of such variations in those industries where they are found to occur.

In any program for the regularization of employment,

seasonal variations, because of their less complex character, offer a logical point of attack. The need for quantitative measures which reveal the sequence and intensity of the seasonal movements is obvious and it is believed that the results of this study possess a real value.

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CHAPTER I

INTRODUCTION

I. Definition of Seasonal Variations

Studies of fluctuations in the volume of employment have revealed the presence of three types of movement, common to most series of economic data: secular trend, cyclical fluctuations, and seasonal variations. The term "secular trend" is applied to the long-time movement persisting over a considerable span of years and reflecting the normal growth in the number of wage earners. This normal growth in employment results from natural increases in population, immigration, and the expansion of industry, involving, in recent years, an increasing number of female workers in industry. Cyclical variations recur with irregular periodicity and intensity over periods of several years, reflecting the alternating waves of prosperity and recession in general business activity. Seasonal variations are repeated annually with an intensity which tends to remain constant relative to the total number employed, although in some series there may be evidence of a progressive increase or diminution.

Analysts of employment fluctuations have focused their attention primarily upon the cyclical movements and have attached relatively small significance to the seasonal variations. The reason for the apparent one-sidedness of the approach is three-fold. First, cyclical fluctuations, unlike seasonal variations, affect many industries throughout the country simultaneously, creating an unemployment problem of serious proportions. Workers released from one industry are unable to secure employment in another when most industries are similarly depressed. Seasonally unemployed workers *may* find relief by transferring to other industries.

Second, the duration of the depression period, though variable, is usually long enough to deplete any reserves which the workers have accumulated and many of them are faced with the possibility of actual want, a situation which necessitates nation-wide coöperation if serious effects are to be avoided. Seasonal idleness is of shorter duration and creates a less acute problem. Third, seasonal variations recur so regularly and are such familiar phenomena that they are overlooked, while the effects of cyclical variations are so conspicuous that they compel attention. Further, many of these seasonal irregularities are known to the workers and are partly provided for by the workers themselves, through transfers to other occupations or by the accumulation of small reserves to carry them through the slack periods.

II. Importance of Seasonal Variations

In spite of this concentration on cyclical fluctuations in employment the importance of seasonal variations is very great, and seasonality produces probably more unemployment in the long run than do the cyclical variations.[1]

1. Seasonal irregularities in employment are so widespread that few if any forms of economic activity are entirely free from them; hence there is a continual flow of labor in and out of employment. A worker who is released from a manufacturing establishment at the end of the period of seasonal activity has open to him two courses of action. He may seek employment in another industry, or, if his resources permit, he may remain idle until the revival of activity in his previous occupation. If he chooses the former course, it is highly probable that some loss of working time will occur in making the change. If he chooses the latter, he will, of course, lose working time throughout the dull season in the industry of his former employment. In either event, seasonal fluctuations in employment create a standing army of unemployed the personnel of which is continually changing as different industries respond to seasonal forces. It is

[1] See *Regularization of Employment*, H. Feldman, pp. 35-41.

safe to say that, regardless of the prosperity or depression of general business, a large number of workers is at all times unemployed because of the seasonal operation of industry.

2. This persistent group of unemployed is of great importance since it forms a foundation which makes the effects of cyclical variations more acute than they otherwise would be. Seasonal idleness causes a recurrent drain on any savings that the worker may attempt to accumulate, unless seasonality in employment is accompanied by larger earnings during busy months. When business is depressed therefore, many workers approach the long depression period with greatly diminished resources or with none at all. Further, when the trough of the business cycle coincides with the trough of the seasonal movement, there is a cumulative effect which magnifies the difficulties, particularly in those industries with seasonal swings of large amplitude. The ironing out of seasonal irregularities in employment would probably not eliminate the effects which cyclical changes produce, but it would certainly simplify the problem.

3. Although employers attempt to retain their most efficient workers during the slack seasons, nevertheless, considerable numbers of good workers are released and many of them fail to return. Overtime operations during the seasonal peaks of activity affect the health of the workers and regular habits of work are impaired by irregularity of employment, thus lowering the morale of the workers and making them less reliable.

4. From the social and economic points of view, the idleness resulting from seasonality in production means a permanent loss of productive energy. Human labor is one agent of production which cannot be stored up for future use, and loss of output is entailed by every idle day. An estimate of the saving which would ensue from the elimination of seasonal movements was given by Mr. Sam A. Lewisohn in his testimony before the Senate Committee on Education and Labor in 1929. Mr. Lewisohn says:

> I have estimated that probably if we were able to do away with that type of unemployment we could save $2,000,000,000 a year in profits. We have unemployed, year in and year out, approximately, let us say 1,600,000 to 1,700,000 men. We could probably do away with a million of that unemployment, which would mean that we have done away with about 3 per cent of the unemployment among those that want work, which number is about 35,000,000. I am just estimating it. Our national income is about $70,000,000,000 a year, and that would mean we might save about $2,000,000,000 a year.[2]

Unemployment arising from the seasonal operation of industry also adds to the burden of poverty. Individuals in the wage-earning group are scarcely capable of making adequate provision for the period of seasonal idleness: first, because frequently the wages paid are insufficient to permit the accumulation of a reserve, and second, because wage earners are not trained in habits of thrift. Hence seasonal fluctuations in employment contribute many needy individuals to the group who require social aid.

5. From the employers' point of view the problem is a costly one. Every employee added to the payroll involves an investment in the education of the worker for his particular job, although he may possess a reasonable degree of skill in his trade at the time of employment. When a worker is released from employment that investment is lost. The exact amount of loss arising from seasonal labor turnover cannot be estimated, but with a regular annual seasonal turnover of at least fourteen per cent[3] in the manufacturing industries alone, the aggregate must be tremendous.

Seasonal operation in industry also creates a heavy burden of overhead. The maintenance of sufficient equipment for between ten and fifty per cent additional workers during the busy seasons must mean large amounts of idle equipment during the slack months. Overhead on such equipment continues whether it is used or not, and when apportioned over

[2] *Hearings before the Senate Committee on Education and Labor*, Seventieth Congress, Second Session Pursuant to S. Res. 219. Washington, D. C., 1929, p. 21.

[3] See page 182.

the articles produced causes increased production costs per unit of output. The smoothing out of seasonal irregularities would materially decrease necessary capital investment and lower the costs of production. Moreover, the increase in costs is, in part, passed on to consumers in the form of higher prices. Thus not only are wage earners and employers affected by seasonality but the public at large must also share the burden.

6. Schemes of unemployment insurance are seriously affected by seasonality, since the seasonal idleness of the insured creates a drain on resources, and leaves smaller reserves with which to meet the demands created by cyclical unemployment. If seasonal irregularities could be eliminated, unemployment insurance schemes could be made more effective.

III. Previous Studies of Seasonal Variations in Employment

Seasonal variations in employment have not been entirely overlooked. This is particularly true in the construction industries and in the garment trades, where seasonal fluctuations have created a serious problem for many years.[4] In the

[4] The following list includes some of the more important publications which have stressed the problem of seasonality in the garment trades and the construction industries:

The Garment Trades:

A Seasonal Industry, Mary Van Kleeck, Russell Sage Foundation, 1917.

Wages and Regularity of Employment and Standardization of Piece Rates in the Dress and Waist Industry, New York City. Bureau of Labor Statistics. Bulletin 146, 1914.

Wages and Regularity of Employment in the Cloak, Suit and Skirt Industry. Bureau of Labor Statistics, Bulletin 147, 1914.

Regularity of Employment in the Women's Ready-to-Wear Garment Industries. Bureau of Labor Statistics. Bulletin 183, 1916.

Dressmaking as a Trade for Women in Massachusetts, May Allinson. Bureau of Labor Statistics. Bulletin 193, 1916.

Variations in Employment: Trends of Women and Men. The Women's Bureau. Bulletin 73.

The Construction Industries:

Problem of Unemployment in the London Building Trades, N. B. Dearle, 1908.

Seasonal Operation in the Construction Industries: The Facts and Remedies. Report and recommendations of a Committee of the President's con-

construction industries, the amplitudes of the seasonal swings are as great as the cyclical movements in many other industries, thus creating a problem of almost cyclical magnitude every year, not only for those directly in the building trades, but for those producing construction materials as well. The garment trades are likewise characterized by seasonal movements of large amplitude and the problem is further complicated by the short duration of the busy periods and the low wages paid to the employees.[5] Some of the more general studies on the regularization of employment have also emphasized the problem of seasonal variations, primarily because it is recognized that these movements are less complex in their origins than the cyclical movements and are more easily controlled.

Analyses of employment fluctuations may be classified in two general categories: those which have dealt with the qualitative side of the problem, determining causes and remedies; and those which have produced quantitative measurements.

A. *Qualitative Studies*

The causes of seasonal variation which have been established by the qualitative studies are climate and social custom, in so far as they affect the demand for, and the supply of, any commodity. Either or both of these causes may operate, tending to produce fluctuations which are repeated regularly from year to year.

The second contribution of the qualitative studies has been an analysis of the remedies which may be used in reducing seasonality. These findings may be briefly summarized:

1. The most important method of eliminating seasonality is that of careful budgeting of production schedules. Thus

ference on unemployment. McGraw-Hill Book Company, Inc., New York, 1924.

The Construction Industry in Ohio, R. J. Watkins. Bureau of Business Research, Ohio State University, 1926.

[5] *A Seasonal Industry*, Mary Van Kleeck, Russell Sage Foundation, 1917.

enterprises, by a study of the supply and demand factors affecting their products, may forecast with considerable precision the volume of production necessary for any particular year. By spreading this total production throughout the entire year, allowing an accumulation of stocks during slack buying periods, and drawing on these stocks during periods of active demand, seasonal variations may be greatly reduced.

2. The above method of stabilization is predicated on a standardization of products. If the articles manufactured are not standardized such production is attended with serious hazards of overstocking. Mutual coöperation, however, between producers may reduce the number of styles and grades to such a degree that this hazard is minimized. In industries producing construction materials the problem has been partly solved by accepting the findings and suggestions of the Simplified Practice Division of the Department of Commerce, which has standardized grades and specifications for construction materials and greatly reduced the number of classifications.

3. Another mode of attack is through the introduction of supplementary lines of production which will fill in the slack periods. In the retail field there is the almost classic association of coal and ice. In the clothing trades activity is maintained during off seasons in some establishments by manufacturing standard articles such as work clothing and house dresses. This method of reducing seasonality is most effective when the supplementary articles can be manufactured on the same machines and marketed through the same sales force as the principal product.

4. Stimulation of off-season demand provides another means of reducing seasonal irregularities. This may be achieved in several ways: (a) Constant advertising may be used to alter the demand. The Coca Cola Company, for example, has, by constant advertising, made its product an all-year-round drink. The Sherwin-Williams Company has stimulated the demand for winter as well as summer painting by skillfully conducted campaigns. Ice cream is no longer

solely a hot weather delicacy but has become a standard dessert in winter as well as summer. (b) Demand may be encouraged by lowering prices or granting discounts on goods ordered during the slack periods for delivery during the busy season. This method involves some curtailment of direct profit on sales but the economies resulting from a stable labor force and the reduction of the burden of overhead have, in many instances, more than offset these losses. (c) Where a particular product is manufactured by a single concern and a trade name is a part of the selling appeal, pressure may be brought to bear on distributors to place orders in the off seasons under the threat that delivery will not otherwise be guaranteed. This remedy obviously has a very limited application since it is open only to manufacturers in a monopolistic or a semi-monopolistic position.

5. In manufacturing establishments producing a diversity of products some stabilization may be effected by training the employees for work in several occupations. When the period of inactivity occurs in one department the worker may be transferred to another where activity has not been curtailed.

In general the qualitative studies have not supported their findings by comprehensive investigations into the extent of seasonality but have been content with the analysis of data for one or two years, from which they have drawn their conclusions.

B. *The Quantitative Studies*

Investigations which have produced quantitative measurements of seasonal variations in employment have been very few. The Federal Reserve Board in the November, 1930 issue of the *Federal Reserve Bulletin* presents seasonal indices of employment for 52 industries based on the data collected by the Bureau of Labor Statistics, supplemented by the reports of the various Federal Reserve Banks. These were computed primarily as correction factors for the series used in the Federal Reserve composite index of manufactur-

ing employment. Little discussion of the seasonal values was offered beyond a formal statement of the data and methods used.

Similarly J. F. Dewhurst in his study, *Employment Fluctuations in the State of Pennsylvania*, has presented seasonal indices of employment for the more important industries in that state during the period from 1921 to 1927, based on the data collected by the Federal Reserve Bank of Philadelphia and coöperating agencies. Again the indices were constructed not primarily for the measurement of seasonal variations but only so that the seasonal element might be eliminated from the series, which were to be combined in a general index for the state. The figures were accompanied, however, by an excellent, though brief, exposition of the causes and importance of seasonality.

In *Industrial and Commercial Ohio*, a publication of the Ohio State University Bureau of Business Research, Messrs. Watkins and Bell show indices of seasonal variations for the more important industries in the state, without comment as to the seasonal causes. Again the values determined were incidental to a general study of employment fluctuations.

C. *Summary of the Contributions and Limitations of Previous Studies*

These studies of the irregularity of employment have contributed much to the fund of knowledge about seasonal variations. It is worth while summarizing their findings and indicating wherein they are unsatisfactory:

1. There is an adequate statement of the forces which produce seasonal irregularities. Custom and climate influencing the demand for, or the production of, a commodity are the factors which produce seasonality.

2. Methods of reducing seasonal irregularities have been developed, based on the experience of industrial establishments which have appreciated the importance of stability of employment and have adopted measures to develop it.

3. Most of the investigations have approached the prob-

lem from a local point of view and have studied the seasonal factors in small areas. Such an approach is highly desirable since the material studied is more apt to be homogeneous than when data from all parts of the country are combined into a single figure. Unfortunately many of these studies have been based on data for only one or two years, a period which is not sufficiently long to establish the normal amplitude of the fluctuations, although some light on the form of the seasonal pattern may be obtained.

4. In the studies of employment which have produced quantitative measures of seasonality in various industries, the measurements have been incidental to the study of cyclical movements. No effort has been made to survey completely even the more important industries to determine whether they are seasonally affected and to ascertain the nature and extent of the movements. Seasonal variations have been measured only when they appear as disturbing influences in the study of cycles.

5. Without exception, the quantitative studies have attempted to picture the total effect of seasonal fluctuations by index numbers which combine the seasonal indices for a number of industries. Such a measure is more likely to be misleading than of real value, since it implies a mobility of labor between industries which does not exist. If the seasonal movements in all industries dovetailed perfectly, such an index might show perfect stability despite extreme fluctuations in the individual industries.

6. With the exception of the Ohio indices, all are based on samples the sizes of which were continually changing during the period of investigation. The Ohio figures covering the period 1914-1929 are derived from reports to the Ohio Division of Labor Statistics; these reports are compulsory for all establishments employing five or more workers. The data used by the Federal Reserve Board are collected by the Bureau of Labor Statistics and the Federal Reserve Banks from firms reporting voluntarily. As more firms have been induced to report, the size of the sample has

steadily increased. This change in the size of the sample may affect the indices of seasonal variations to an appreciable degree. The indices for Pennsylvania were based on data for the period 1921-1927 collected by the Philadelphia Reserve Bank, the Pennsylvania Department of Labor and Industry, the Anthracite Bureau of Information, the Interstate Commerce Commission, and the U. S. Employment Service. During the period for which the seasonal indices were computed, several extensions in the field covered were made.[6]

IV. Purpose and Method of This Study

Seasonal fluctuations in the number of wage earners employed offer the logical point of attack in any program for the regularization of employment. The reason for this is fourfold. First and most important, the fluctuations are regularly repeated from year to year and hence may be forecast with comparative precision. Second, the causes of seasonal variations are less complex than cyclical causes and yield more readily to analysis. Third, the short duration of the seasonal slack period makes it possible for employers to work out schemes for budgeting production which will permit them to retain their working personnel intact. Fourth, the problem is one which may be attacked by employers individually or collectively. Examples of the stabilization of employment by individual enterprises are common. The effect of seasonal variations may be minimized for small areas through the coöperation of employers, whereas the reduction of cyclical movements would require national or even international effort.

In a scientific approach to the problem of regularization, the need for quantitative measures is self-evident. It is necessary, first of all, to know which industries are affected by seasonal forces and to what degree. It is the purpose of this study to answer these questions for the more important

[6] For a more complete discussion of the probable effect of the changing size of the sample see page 17.

manufacturing industries in the United States in so far as the data available will permit. Measures of seasonal variation will be presented for industries, for groups of industries, and for the larger manufacturing industries as a whole. Seasonal causes will be discussed where the information is available, but in many instances the heterogeneity of the Census classifications is so great that an exact statement of seasonal causes is impossible. A detailed analysis of the factors which produce seasonal movements in employment in each industry would involve a breakdown of the Census classifications into more restricted groups, and the study of supply and market factors for each product in relation to seasonal influences. Data for such a study are not available. Moreover, the indices presented are based on data of the Census years from 1904 to 1925 and the question naturally arises as to their validity for subsequent periods. However, the underlying causes of the seasonal movements, climate and social customs, are of such a permanent character that it seems doubtful whether there will be marked changes in the patterns, though random fluctuations or gradual progressive changes in amplitude are entirely probable. The persistence of the seasonal patterns is clearly indicated on the dispersion charts which accompany the graphic presentation of the indices.

Some general comparisons and analyses will also be offered. The seasonality in industries manufacturing raw materials and producers' goods will be contrasted with seasonality in industries manufacturing consumers' goods, subject to elastic and inelastic demands, to determine, if possible, whether they differ in the extent of their responses to seasonal causes. An effort will be made to determine the degree to which the seasonally affected industries depend upon women for the additional labor necessary during the seasonal peaks. And, finally, the study will endeavor to discover the effect of the size of the establishment on the degree of seasonality. Do industries with a large number of wage earners per establishment show greater stability of employment be-

cause large-scale production affords greater opportunities for successful budgeting of production schedules and the interchange of employees between departments?

A. *The Data Used*

Data on the number of wage earners employed on the fifteenth day of each month or the nearest representative day are reported by industries in the Bureau of Census Reports for the years 1904, 1909, 1914, 1919, 1921, 1923, and 1925. These figures have formed the basis for the computation of the seasonal indices which are presented in this study. The method of collection of the information was uniform throughout the period but in 1921 and subsequent years the information was required only from those establishments whose annual output was valued at $5,000 or more. As far as can be determined, seasonal patterns remained the same and there was no appreciable change in the intensity of the fluctuations. It should be noted that the data of the Census are secured from reports filed at the close of the year. There is a distinct absence of continuous reporting even in the Census years. This fact raises a legitimate question as to the accuracy of the Census figures. In those cases where the manufacturing establishments have kept accurate records of employment, the figures reported are probably as satisfactory as any that might be reported continuously. On the other hand, if careful records are not kept, the figures reported probably represent only a more or less accurate estimate. The exact effect of this process of estimation on the total employment figures for an industry is uncertain. There is probably an absence of any conscious bias on the part of estimators and hence at least a portion of the errors will be compensated. However, an estimate is likely to be colored by most recent experience and if employment at the end of a year is relatively high, an estimate of employment at the beginning of the year is likely to be too large and conversely with low employment at the close of a year, the

estimate for the first of the year may be too small. It is believed, however, that the effect of these errors on the seasonal indices derived from Census data is relatively small, since a compensation of the errors occurs at two points. First, as has already been pointed out there is probably an absence of any conscious bias on the part of the estimators and hence there will be some compensation of error in the Census figures as reported. Second, when the employment data for different years are averaged to secure the seasonal index a further compensation takes place.

Not all industries have been included in this investigation, those being excluded which reported less than 10,000 wage earners in 1925. There was a twofold reason for this arbitrary limitation. First, it is probable that the seasonal movements in the smaller industries are more greatly affected by chance factors, thus rendering the measurement of seasonal variations less certain. Second, in carrying the data for the various industries back to the year 1904, many of the smaller industries would show such an insignificant number of wage earners during the early years that the conclusions would be of little value. Also certain of the smaller industry designations were not reported separately in the earlier years.

It would have been highly desirable to use the employment figures collected for the *Biennial Census of Manufactures for 1927*, but the information, although reported, has never been tabulated and hence is not available for use. It is to be hoped that at some future time this information will be put in a form which will make it available for further employment studies.

Monthly employment data were available in Census reports earlier than 1904 but it was felt that with the possibility of changes in the seasonal patterns for different industries, the use of the data for the earlier years would detract from, rather than add to, the accuracy of the seasonal indices.

B. *The Methods Employed*

Thus there were available for analysis, data on the number of wage earners employed in seven years separated by varying time intervals. This lack of continuity in the data was the determining factor in the selection of the method of computation of the seasonal indices. The conventional methods of measuring seasonal variations in continuous series were entirely inapplicable in this case. The procedure was as follows: first, to express the employment figures for each month as relatives of the average number employed during the year; second, to plot these values and to examine the curves for evidence of seasonal movements which were repeated from one Census year to another. Industries whose employment curves failed to demonstrate a persistent regularity of seasonal movement were eliminated from further consideration. Ninety-nine out of one hundred and twenty-six industries showed evidence of a regular recurrence of seasonal movements, and for these industries seasonal indices were computed.

The seasonal indices were obtained by taking a selected arithmetic mean of the relatives for each month, omitting the largest and the smallest values in an endeavor to eliminate the extreme cyclical and random effects which were evident in certain years. In a few series, where these fluctuations were particularly evident, the *largest two* and the *smallest two* values were omitted. The values so obtained were centered on the average for the year taken as 100.

In addition to the cyclical and random factors many of the series were affected by a secular trend sufficiently steep to impart an upward or downward trend to the seasonal indices. In these cases the average numbers employed each year were reduced to relatives of the average number employed in all years. Straight line trends were fitted to these relatives and the annual trend increment was obtained. This value was divided by twelve to obtain the monthly incre-

ment, which was applied as a correction factor to the seasonal values, the resulting figures being the final seasonal indices.

The seasonal curves of employment for four industries showed a progressive change in the amplitude of the fluctuations. In these cases, the method just described was not used. Instead of being averaged the monthly relatives for the same month of each of the Census years were plotted chronologically. A free hand curve was fitted to these points and projected forward to 1929 in order to secure values for the same month which would be comparable with the Federal Reserve indices. Thus in order to secure a seasonal value for January 1929, the January relatives for the seven Census years were plotted. A freehand trend was fitted and projected forward to 1929, the values being read directly from the curve. A similar procedure was followed for each of the other months. While such a method is subject to a large margin of error, the results agreed closely with the seasonal indices for the same industries computed by the Federal Reserve Board.

C. *Form of Presentation*

In the following chapters the seasonal indices are presented in both graphic and tabular form, and wherever possible a comparison is made with the indices for the same industries computed by the Federal Reserve Board, and with similar data for the states of Ohio[7] and Pennsylvania.[8] The purpose of this comparison is to verify the patterns derived from the Census data.

Perfect agreement was not to be expected for several reasons. First the Ohio and Pennsylvania indices are for small areas, while the Census figures embrace industries over the entire country. Local differences in the reactions to seasonal forces produce some variations in the patterns, and secondly, the smaller size of the samples reduces the op-

[7] *Industrial and Commercial Ohio*, R. J. Watkins and S. O. Bell (Mimeo.).
[8] *Employment Fluctuations in Pennsylvania, 1921-1927*, J. F. Dewhurst, Pennsylvania Department of Labor, 1928.

portunity for the cancellation of the seasonal movements of different establishments; hence the state indices tend to show seasonal swings of greater amplitude than are to be found in the Census indices.

It was to be anticipated that the Census indices would agree more closely with those computed by the Federal Reserve Board since the latter are also collected from a nation-wide area, but somewhat greater amplitudes were to be expected in the smaller sample. In general this expectation was satisfied since in seventy-five per cent of the cases the amplitudes of the Census indices were less than those of the corresponding Federal Reserve indices. The data used by the Federal Reserve Board are those collected monthly by the Bureau of Labor Statistics, supplemented by the data reported by the Federal Reserve Banks in the various districts. The establishments reporting are not constant in three consecutive months either in number or identity, and from 1922 to the present time the number of establishments has increased steadily. Hence two types of variations may affect the Federal Reserve indices—a progressive change in the size of the sample, and the random fluctuations resulting from the difference in the number and identity of the firms reporting. The latter are the less important since in averaging the monthly relatives over a reasonably long period of years the random effects tend to cancel each other and produce little distortion in the seasonal pattern. The variations due to a progressive change in the number of establishments reporting, however, may definitely affect the amplitude of the seasonal movements and create an impression of a changing amplitude which would not appear if the data for identical establishments were regularly reported. Thus during the earlier years with few establishments reporting, the amplitudes of the seasonal swings would be normally much greater, and as more firms were added the severity of the seasonal movements would be greatly diminished. This would be true particularly in the industry classifications in which the types

of manufacturing are not entirely homogeneous. In these cases it is highly probable that the inclusion of additional establishments would progressively reduce the amplitudes of the seasonal movements. For a number of industries the Federal Reserve Board has concluded that the seasonal amplitudes are changing, and therefore present a different set of values for each year, but the question may be raised as to whether these changes really indicate an alteration in the seasonal pattern or merely reflect the change in the size of the sample. In several instances the indices derived from the Census data have supported the conclusion of a changing seasonal curve, but in the majority of cases, there is no discernible change in the Census figures which are reported at irregular intervals over a span of twenty-one years. It is possible, however, that since the time intervals covered overlap for only a few years, changes in the seasonal swings have developed since 1923 or 1925 which would not be revealed in the Census data. In the absence of Census enumerations for the same years as those on which the Federal Reserve indices are based, it is impossible to determine which of these explanations is correct.

In the graphic presentation of the indices the same scale is used throughout except in the case of "Canning, Fruits, Vegetables, etc.," where the scale has been exactly halved. Each chart is supplemented by a diagram showing the dispersions of the monthly relatives, the solid line representing an average of the monthly relatives omitting the extreme items. The diagrams designated as "Dispersion of Seasonal Indices" are offered as the visual check on the validity of the Census patterns presented. With few exceptions these charts show a reasonably close grouping of the seasonal relatives. It may be noted that the seasonal curves shown on the dispersion diagrams do not agree in all instances with the curves shown on the larger charts. This is due to the fact that on the small diagrams there has been no correction for secular trend, while on the large charts this correction has been introduced.

In the discussion of the seasonal causes, it has been impossible to give specific references save in a few instances. Several books have been of particular service in ascertaining the reasons for the seasonal patterns. The Agricultural Yearbooks from 1921 to 1925 inclusive have provided material for the discussion of seasonality in the industries dependent on agriculture for their raw materials or for their markets. *Seasonal Operations in the Construction Industries* was an invaluable aid in the determination of seasonal factors in the construction materials industries. Bulletins of the Bureau of Labor Statistics[9] provided source materials for the textile industries. In other instances where no references are given a general knowledge of the products of the industry and the characteristics of their markets provides the basis for the statement of the probable seasonal causes. It is entirely probable also, that in some cases other causes than those suggested are operating. For an adequate statement of all the seasonal factors, it would be necessary to scrutinize in detail all phases of the distributive process and the necessary time intervals between production and sale to the final consumer.

[9] See footnote page 5.

CHAPTER II

SEASONAL VARIATIONS IN EMPLOYMENT IN THE FOOD AND TOBACCO INDUSTRIES

The Food Products Industries

The U. S. Bureau of the Census, in the *Biennial Census of Manufactures for 1925* classifies twenty-five industries as engaged in the manufacture or preparation of food products. Of these, twelve fall within the scope of this study, each having an average employment amounting to or in excess of 10,000, and employing 619,732 wage earners out of a total of 664,760 in all food manufacturing industries. These twelve industries, without exception, show variations in employment which are regularly repeated each year. An explanation of this uniformity of seasonal response is not difficult to find. No other group of industries is more completely dependent on the succession of the seasons than that engaged in the manufacture of foods. Food products may be divided into three classes. In the first class are the products derived from agriculture, grazing, and fishing, whose production, regardless of demand, is responsive to the vagaries of the weather. In the second are such articles as soft drinks and ice cream, whose production reflects sharply the effect of temperature changes on demand. Thirdly, there are products, such as confectionery, which are affected by the seasonality in social habits of buying, induced by such holidays as Christmas and Easter. In each case there results a distinct seasonality of production with attendant seasonal variations in employment.

In the following sections, each of the twelve industries is discussed. Seasonal indices are presented and where possible the validity of the seasonal pattern is verified by comparisons with other seasonal indices for the same industry.

Flour, Feed, and Other Grain-mill Products

The establishments classified in this industry are those engaged primarily in the manufacture of flour or meal from wheat, corn, or other grains. Mills whose products are the result of further manufacturing processes—for example, those making breakfast foods, or other prepared feed for live stock and poultry—are classified in the "Food preparations, not elsewhere classified" industry. Although some of these manufacturers of food preparations purchase certain grain-mill products and put them through further manufacturing processes, others use grain as their basic raw material and perform all the processes necessary to convert it into the finished product. The "Flour, feed, and other grain-mill products" industry does not, therefore, embrace all mills which use grain as material.[1]

Indices of seasonal variations in employment in the "Flour, Feed, and Other Grain-mill Products" industry, computed from the Census data, are shown in Chart I together with the Federal Reserve indices for the same industry. With minor differences the two curves agree closely both in pattern and amplitude, showing the low points of employment in May and June, followed by a steady rise until October. After the fall maximum there is a steady decline continuing until the following June.

The seasonal pattern for the industry is dependent on the growing and harvesting periods of the grains. The new crop of wheat comes on the market in July and continues through August, the supply accumulating more rapidly than the mills can dispose of it. Hence the upswing in employment in the flour industry begins in July and reaches its maximum in October. It is followed by a steady decline as the supply of wheat and other grains diminishes.

Bread and Bakery Products

This classification is applied to industrial establishments engaged primarily in the baking of bread, biscuits, crackers, cakes, pastry, etc. Hotels, restaurants, and boarding houses are not included, but bakeries operated in connection with restaurants are included whenever it is possible to segregate the bakery business from the restaurant business, or, if such segregation is impossible, where it is

[1] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 111.

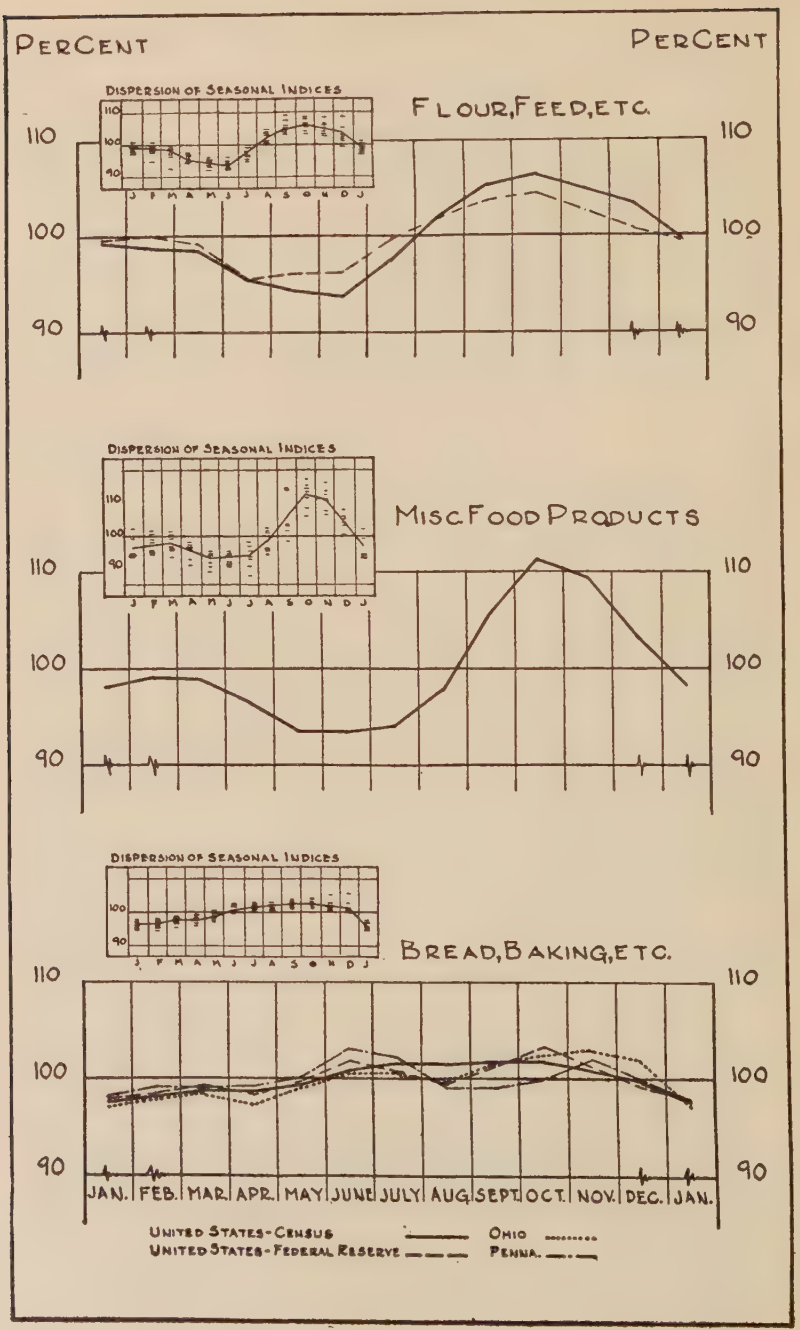

CHART I. INDICES OF SEASONAL VARIATION IN EMPLOYMENT IN THE MANUFACTURE OF FLOUR, FEED, AND OTHER GRAIN-MILL PRODUCTS, MISCELLANEOUS FOOD PRODUCTS, AND IN THE MAKING OF BREAD AND OTHER BAKERY PRODUCTS.

TABLE 1

Seasonal Indices of Employment in the Food and Tobacco Industries, Based on U. S. Census Data, 1904–1925

Industry	Average Number Employed 1925	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range	Average Deviation
Food															
Beverages	27,384	83.6	84.3	88.4	95.6	105.0	120.2	126.2	120.8	110.3	96.7	86.2	82.7	43.5	13.8
Bread	160,411	97.5	98.1	98.9	98.6	99.1	100.8	101.6	101.4	101.4	101.9	100.9	99.8	4.4	1.3
Butter, Cheese, etc	28,274	84.5	85.9	89.8	99.3	109.4	116.1	115.3	111.0	105.5	99.8	94.0	89.4	31.6	9.6
Canning, Fruits and Vegetables	85,866	37.2	36.5	39.5	44.8	49.8	85.4	137.5	207.1	248.8	169.8	88.1	55.5	212.3	60.5
Canning, Fish and Oysters	10,530	73.9	75.1	78.1	86.1	80.7	82.2	100.1	137.3	144.1	141.4	118.7	82.3	70.2	23.6
Confectionery	63,600	92.8	95.0	95.8	92.2	90.7	89.9	87.1	95.6	109.3	118.4	119.5	113.7	32.4	10.2
Flour	31,988	99.5	99.0	98.4	95.5	94.2	93.9	97.5	102.1	105.3	106.3	104.9	103.4	12.4	3.7
Food Preparations	28,797	98.0	98.9	98.9	96.3	93.3	93.0	94.0	97.9	105.9	111.2	109.4	103.2	18.2	5.0
Ice Cream	23,044	79.2	80.5	85.6	95.9	107.2	123.0	129.0	124.0	112.7	95.7	85.1	82.1	49.8	16.0
Ice, Manufactured	24,915	68.4	70.2	78.0	92.9	110.1	128.4	137.4	136.4	127.2	102.1	78.8	70.1	69.0	23.6
Slaughtering	120,442	108.5	104.8	99.7	94.6	94.7	97.7	97.5	95.8	97.3	101.1	103.4	104.9	13.9	3.8
Sugar Refining	14,502	86.2	101.1	103.1	107.9	106.9	107.4	105.8	104.0	100.7	95.1	91.7	90.1	21.7	6.2
Tobacco															
Cigars and Cigarettes	117,108	98.6	100.0	99.6	97.2	97.6	97.4	98.0	99.0	101.0	103.6	105.0	103.0	7.8	2.1
Chewing and Smoking	15,024	97.0	101.5	100.2	99.5	97.4	100.0	99.5	100.2	102.1	101.7	101.5	99.4	5.1	1.2

obvious that the income derived from the bakery business constitutes the greater part of the total income.[2]

Employment statistics in this industry are available in the Census of Manufactures reports from 1904 to 1925 inclusive, and hence there are data for seven years from which to determine indices of seasonal variation.

A study of Chart I shows that there is not a complete agreement between the seasonal indices derived from Census data and the Federal Reserve, Ohio, and Pennsylvania indices, but the disagreements are in the amplitudes rather than in the patterns of the movements. The difference between the Ohio and the Census indices is probably due to the size of the samples. The Federal Reserve Board, however, designates the industry as one of changing seasonality and their curve is derived from their indices for the year 1929, which may explain its greater amplitude. If there is a real change in the seasonality in baking, it is not discernible in the monthly relatives based on Census data. They are closely grouped about their means and show no tendency toward a progressive change.

If the smaller fluctuations are disregarded, the seasonal pattern may be described as showing low employment during the winter and spring months with high employment in the summer and fall. This movement reflects the different degrees of dependence on commercial bakery products throughout the year. During the summer months the housewife avoids the heat of the kitchen and depends on the commercial bakery for pies, cakes, pastries, and bread, but during cold weather many of these articles are home-made and the demand for the commercial products declines.

The seasonal pattern is marked by three minor peaks in March, June or July, and October or November. Each of these is a reflection of an increased demand stimulated by the Easter, Fourth of July, and Christmas festivities.

[2] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 38.

Food Preparations, Not Elsewhere Classified

This industry classification covers the manufacture of a large number of food preparations which do not belong in any of the other classifications. Among these are: Cereal preparations, such as breakfast foods, hominy, hulled corn, prepared flour, and cereal coffee substitutes; lard substitutes and cooking fats; macaroni, spaghetti, and similar products; such meat products as boiled and boneless ham, sliced dried beef, and canned and potted meats, not produced in packing houses; peanut butter; blended and compounded sirups; and other preparations, such as mince meat, potato chips, ice cream cones, malted milk and malted-milk products, and prepared feed for animals and fowls. The shelling of nuts (other than peanuts), the pulverizing of sugar, the slicing of meats, and like operations, when carried on by large establishments for the purpose of preparing foods for the trade are also included.[3]

The indices which are offered here are based on the Bureau of Census reports. No indices from other sources were available and even if they had been obtainable it is doubtful whether comparisons would have been made because of the heterogeneity of the group and the great probability that the various industries included would not be present in the same proportion as in the Bureau of Census figures. It may seem questionable to present seasonal indices for such a miscellaneous group, but an examination of the dispersion diagram in Chart I shows that there is a well-defined seasonal pattern, although the scatter of the monthly relatives about their means is much greater than in any other classification in the food industries group.

The analysis of the chart shows an increase in employment from January to March, a decline until June, a fairly rapid rise to a peak in October, and a decline through November and December. The shape of this seasonal pattern may be accounted for in some measure by the fact that all of the industries included within the group are engaged in the preparation of the products of agriculture and grazing, and consequently depend upon the growing and breeding periods. The minor peak in March is probably the reflection of an Easter demand for some of the products.

[3] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 131.

Slaughtering and Meat Packing

This industry classification covers establishments engaged in wholesale slaughtering and meat packing, including abattoirs engaged wholly or chiefly in custom slaughtering. Plants that slaughter for the retail trade but also wholesale considerable quantities of meats are also included, and the reports made by such establishments generally cover both branches of their operations. Establishments slaughtering for the retail trade only do not come within the scope of the census. Those engaged exclusively or principally in the manufacture of sausage or in the killing and dressing of poultry are not classified in this industry. . . . Establishments treated as belonging in the slaughtering and meat-packing industry at one census, may because of changes in the character of their business be otherwise classified at another. The statistics, however, cover practically all important establishments engaged wholly or chiefly in slaughtering and meat packing for the wholesale trade.[4]

It will be noticed that there is a very close agreement in the seasonal patterns of all four sets of indices (See Chart II) though there are slight variations in amplitude. All of them show a decline from January until April, a rise to July, a slight drop in August, and then a gradual rise until the end of the year. These variations are explainable in terms of meat production and consumption. During the winter months the consumption of meat is much heavier than during the summer and at the same time the supply is at a maximum. In the spring there is a declining supply, and at this time comes the breeding period, during which slaughtering is necessarily curtailed. The relatively low position during the summer arises from two causes. First, there is a smaller consumption of meat, and second, the young animals have not yet attained sufficient maturity to be marketable as first-class meat.

Canning and Preserving

Establishments engaged primarily in canning and preserving are grouped, for census purposes, into two industries: (1) Canning and preserving—fruits and vegetables, pickles, jellies, preserves, and sauces; (2) canning and preserving—fish, crabs, shrimps, oysters, and clams. The products of the first of these industries may be

[4] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 182.

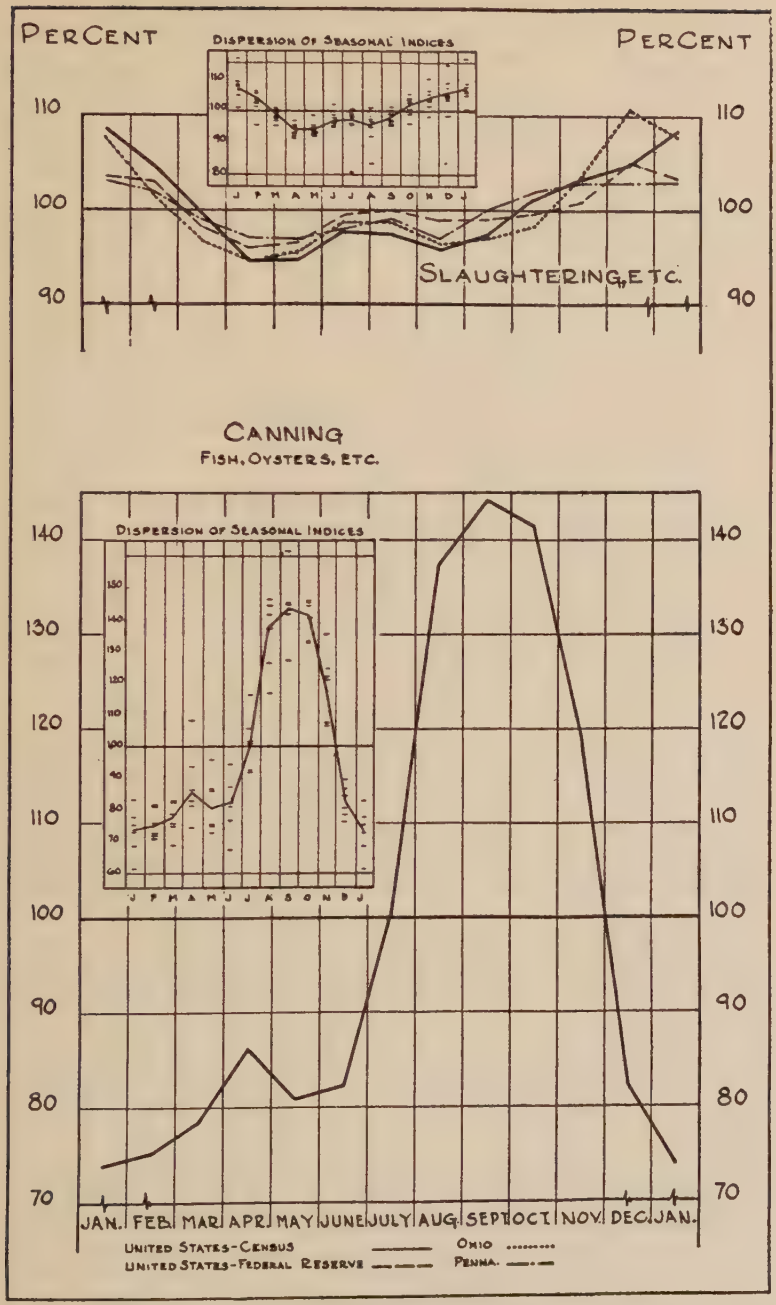

CHART II. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE SLAUGHTERING AND MEAT-PACKING INDUSTRIES, AND IN THE CANNING OF FISH, OYSTERS, AND OTHER SEA FOOD PRODUCTS.

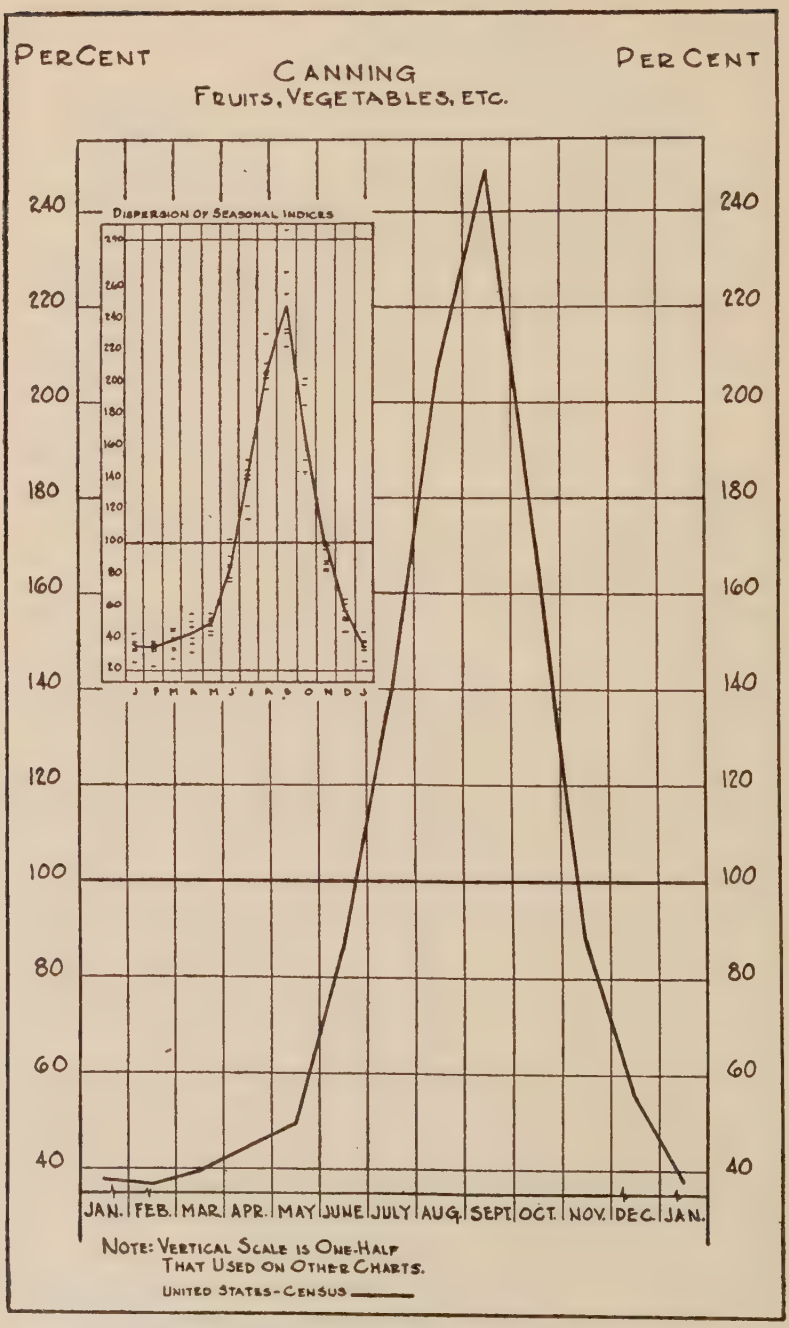

CHART III. INDEX OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE CANNING OF FRUITS, VEGETABLES, AND CONDIMENTS.

classified in six major groups, namely, canned vegetables and soups; canned fruits; dried fruits; dried vegetables; preserves, jams, jellies, and fruit butter; and pickles, sauces, salad dressings, ketchup, etc. The products of the second industry are canned, pickled, smoked, dried, and boneless fish, and canned shrimps, oysters, clams, etc.[5]

Seasonal indices of employment for the first group are shown in Chart III. (It should be noted that the scale used in this chart is exactly one-half the size of the scale used in all others in this study; hence the fluctuations are twice as great as they appear on casual inspection.)

The causes of this seasonal pattern may be traced directly to the growing period of the raw materials used. Starting with the month of May and rising rapidly the curve of employment reaches its peak in September and then declines precipitously until the end of the year, remaining low during the first three months of the year. The raw materials handled by the industries in this group are of such a highly perishable nature that production and employment fluctuate in close conformity with the maturing of the vegetable and fruit crops.

The other branch of the canning industry is devoted to the preparation of canned, pickled, smoked, dried, and boneless fish, and also canned shrimps, oysters, and clams. This classification is not entirely satisfactory. In the earlier Census years a separation was made between the fish and shellfish products, a separation which should have been continued. In securing the data for the years in which a distinction was made, it was noticed that the seasonal movements of these two divisions were not synchronous. The months of May, June, July, and August showed practically a minimum of employment in the shellfish group, while on the other hand the production of the fish products rose rapidly during these months. The lack of activity in the shellfish industry may be traced to two causes. First, the flavor of oysters is poorer during the summer months, and second, their perishability makes handling in warm weather extremely difficult. The effect of the divergent seasonal tendencies may

[5] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 66.

be seen in Chart II. Employment rises steadily until the month of April and then takes a distinct drop in May at the time when the oystermen cease their operations for the summer. During May and June the curve remains low and then rises rapidly, reaching its peak in September, at the time that oystering is resumed. After September there is a rapid decline until the end of the year, traceable directly to the increasing inclemency of the weather, which makes fishing, clamming, and oystering hazardous. There is a further factor, for the migrations of fish begin in September and continue until midwinter.

Butter, Cheese, and Condensed Milk

> These industries consist in the manufacture of butter, cheese, condensed milk, and certain related products in factories not located on farms. . . . Skimming or separating stations operated in connection with butter factories have been included as parts of the factories. Independent separating stations and establishments which were engaged primarily in the purchase and sale of milk and cream but which incidentally manufactured small quantities of butter and cheese from surplus stock have not been included. Establishments engaged primarily in the manufacture of malted milk are classified under the designation "Food preparations, not elsewhere classified."[6]

Chart IV shows the seasonal pattern of employment in this industry. It is characterized by a minimum in January succeeded by a steady rise to a peak in July and then an equally steady decline until the following January. These movements are a direct reflection of the seasonal fluctuations in the supply of milk. The calving period begins in March or April and the supply of milk reaches its peak in June.[7] The perishable nature of the commodity requires it to be promptly handled; hence there is a close relation between production and employment in the butter, cheese, and condensed milk industries and the variations in the milk supply.

The indices for Ohio, also shown on Chart IV, are in complete agreement with the Census indices as to pattern but show a somewhat smaller amplitude.

[6] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 50.
[7] *Agriculture Year Book, 1921*, Department of Agriculture, p. 287.

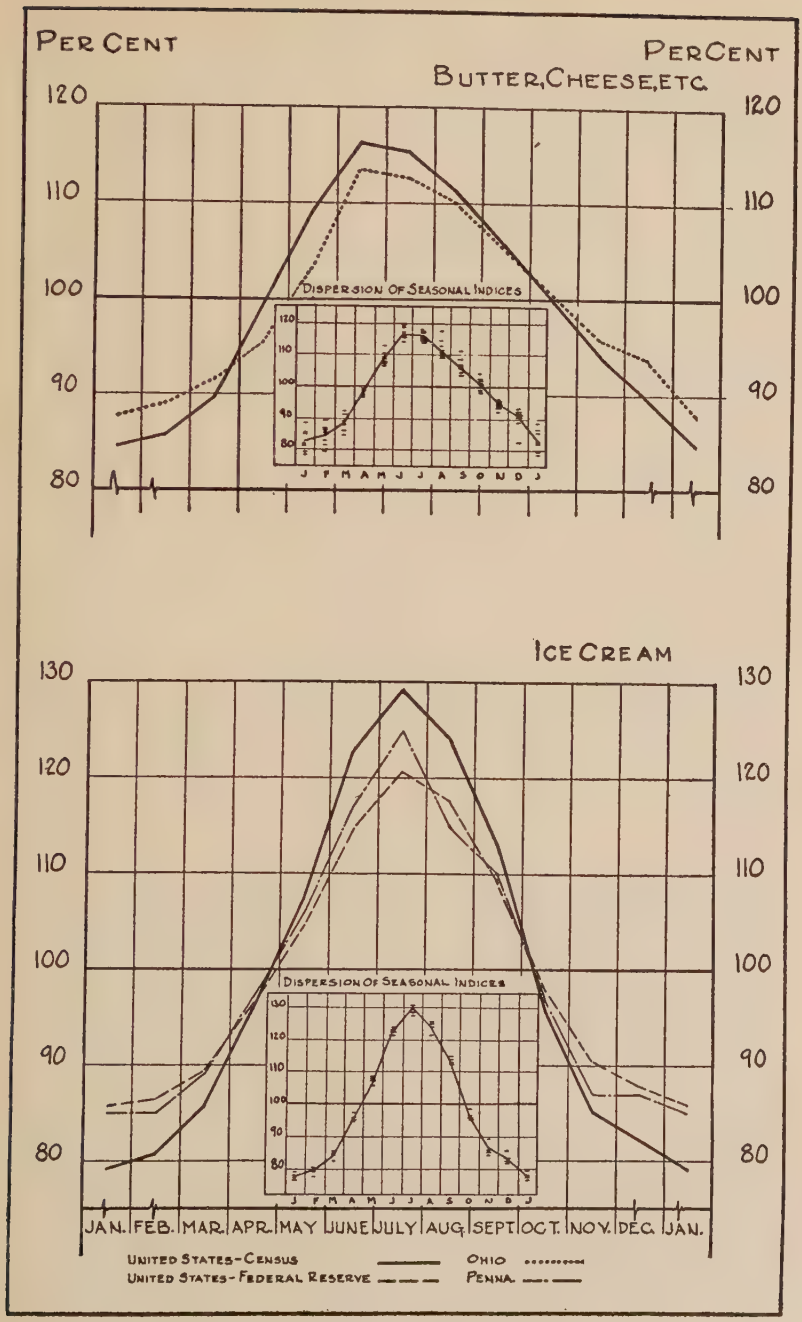

CHART IV. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF BUTTER, CHEESE, CONDENSED MILK, AND OTHER DAIRY PRODUCTS; AND ICE CREAM.

Ice Cream

> This classification embraces those establishments whose principal products are ice cream, water ices, sherbets, and frozen custards. It does not, therefore, cover the manufacture of these products by hotels and restaurants, nor that by retailers for use in their soda fountains.[8]

Data on employment in the manufacture of ice cream have been reported separately only since 1919, and therefore the Census indices presented in Chart IV are based on only four observations. However, the diagram showing the dispersion of the monthly relatives about their means indicates clearly the seasonal pattern and a constancy of amplitude for each of the months.

Although ice cream has become a year-round dessert, nevertheless its consumption is accelerated in hot weather and retarded in cold. Hence employment in the manufacture of ice cream fluctuates in close agreement with temperature changes.

A comparison of the Federal Reserve, Pennsylvania, and Census indices shows complete agreement as to the seasonal pattern though there are differences in the seasonal amplitudes which probably result from the differences in samples.

Beverages

> This classification covers establishments engaged primarily in the manufacture of fruit beverages, cereal beverages, carbonated beverages (not including spring water). . . . Establishments engaged solely in bottling products manufactured by others, or natural waters, are not classified in this industry. . . . The manufacture of cider is not included here. . . . In the main, the statistics do not include data for establishments which manufacture fruit beverages and sell them at retail. . . .[9]

Statistics on employment in the manufacture of beverages have been available in usable form since 1921. Prior to that date the items which are now grouped under this title

[8] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 139.
[9] *Op. Cit.*, p. 31.

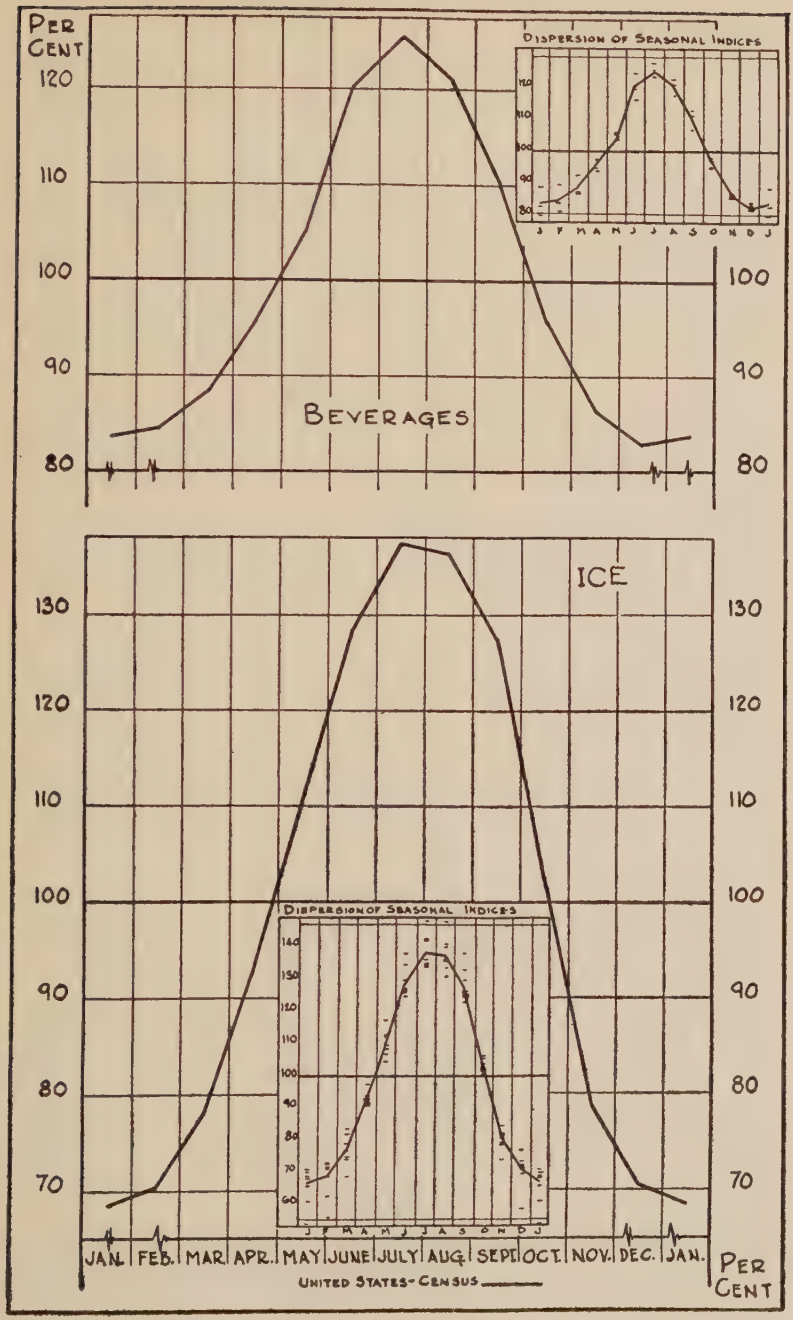

CHART V. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF BEVERAGES AND ICE.

were classified under a number of other designations and no separation of the early figures has been made. Hence there are available in the Bureau of Census reports the data for only the three years, 1921, 1923, and 1925.

There may be a question as to the statistical justification for the construction of an index of seasonal variations based on three observations. An examination of Chart V, however, indicates that the seasonal pattern is well defined, not only in the periodicity but also in the amplitudes of the variations. Such irregularities as occur may be traced directly to extremes in the weather. For example, in the particularly hot June of 1925 the employment figures were relatively higher than in any other year, but at the same time there is a maximum difference between the highest and the lowest June of only eight per cent. There is reason to believe, therefore, that the indices presented form a reasonably accurate picture of the seasonal changes in employment for this industry.

The causes of seasonal variations in the manufacture of beverages are so obvious that they require no elaboration. The refreshing quality of fruit juices and soft drinks creates during the heat of the summer a demand which reaches its maximum in July. As the hot weather passes, the demand falls off rapidly, attaining its lowest point in December.

Ice, Manufactured

> This industry classification embraces all establishments engaged primarily in the manufacture of ice for sale. (The cutting and storage of natural ice is not treated as a manufacturing operation.)[10]

Chart V shows the indices of seasonal variation in employment in the manufacture of ice. The seasonal pattern is well defined, showing minimum employment in December, January, and February, followed by a rapid rise to a maximum in July, when employment declines steadily until midwinter.

Temperature changes are directly responsible for these

[10] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 146.

variations in employment. Ice is used almost exclusively for refrigeration purposes, and hence the demand for ice increases during the warm weather and declines during the cold.

There is a close agreement in the seasonal patterns for ice, ice cream, and beverages, as might be expected since all three are directly affected by temperature changes, but ice shows a considerably greater amplitude in its fluctuations, probably because it is used for the refrigeration of a wide variety of products.

Cane-sugar Refining

The cane-sugar refining industry embraces establishments engaged in the refining of raw cane sugar, the greater part of which is imported.[11]

Indices of seasonal variations in employment in the refining of cane sugar are shown in Chart VI. There is far from complete agreement between the Pennsylvania, Federal Reserve, and Census figures either in amplitude or seasonal pattern, though the Federal Reserve and Census indices agree in showing low employment from November until February and above average employment from March until September. The amplitudes of the fluctuations in the Pennsylvania indices are much greater and the period of "below average" employment is one month longer than that shown by the Census indices.

Part of the difference between the Census and the Federal Reserve curves may be explained by the fact that the Federal Reserve Board finds a changing seasonal and the curve shown in Chart VI is for 1929. The data on which the Census indices are based do not give evidence of changing seasonal characteristics, but the monthly relatives are widely dispersed about their means, and hence the representativeness of the Census indices is open to question, particularly since the data for several of the years are affected by the disturbing influence of the World War. The differ-

[11] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 207.

ences displayed by the Pennsylvania indices are such as may well occur in samples drawn from a small territory.

Confectionery

> The establishments classified in this industry are those whose principal products are candies and confections, cake ornaments, popcorn balls or cakes, salted nuts, stuffed dates, and similar products, not including chewing gum. . . . .[12]

The seasonal pattern of employment in the manufacture of confectionery, shown in Chart VI, is characterized by a minimum in January followed by a rise to a minor peak in March caused by the demand of the Easter trade. From March until July there is a steady decline, succeeded by a rapid increase to a peak in November. This upswing is the result of two factors, the maturing nut crop and the preparation for the Christmas trade. After the satisfaction of the Christmas demand, production declines to a winter low in January.

The Federal Reserve and Pennsylvania indices are shown in Chart VI. The former agrees closely with the Census curve both in pattern and amplitude except that the Federal Reserve indices fail to show the spring peak which is created by the Easter demand. The exact reason for this failure cannot be determined. The indices for Pennsylvania show a pattern essentially similar to that traced by the Census data but the amplitude of the fluctuations is much smaller. This probably is due to the fact that the data are for a limited area, while the Census figures are collected from all parts of the country. Particular local characteristics may cause figures for an industry collected from a small territory to show less variation than figures for the entire country.

The Tobacco Industries

The tobacco industries are classified into two divisions: (1) those industries primarily engaged in the manufacture of chewing, smoking, and snuff tobaccos, and (2) those whose products are principally cigars and cigarettes. Both

[12] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 94.

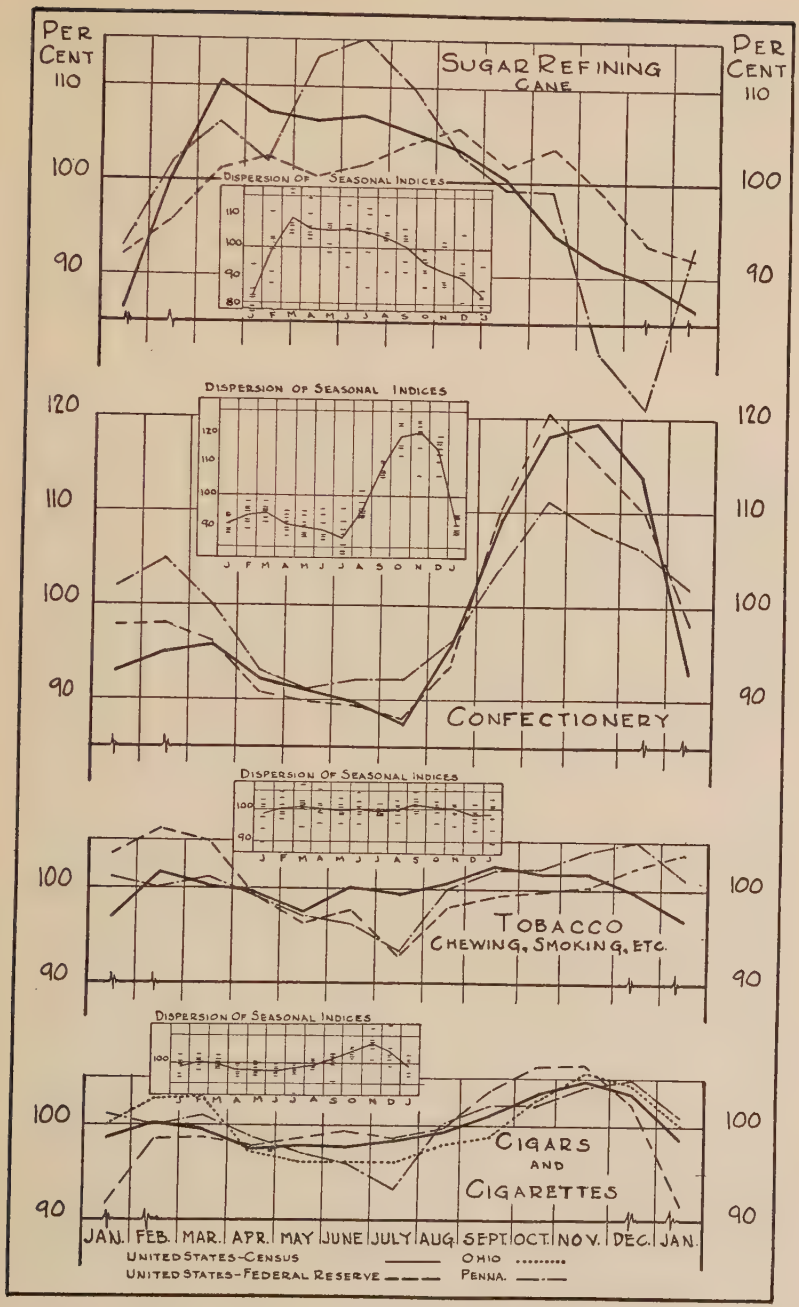

CHART VI. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN CANE-SUGAR REFINING AND THE MANUFACTURE OF CONFECTIONERY, OF CHEWING, SMOKING, AND SNUFF TOBACCOS, AND OF CIGARS AND CIGARETTES.

divisions of the industry show seasonal variations in employment which are produced by the fluctuations in the supply of raw tobacco.

The inclusion of the tobacco industries with the food industries is purely a matter of convention and convenience, although justification may be found in the mutual dependence on agriculture and in the similarity of the factors which govern demand. Food is essentially a necessity while tobacco is a luxury, but for confirmed users, tobacco is almost as much a part of their routine existence as food.

Tobacco: Chewing, Smoking, and Snuff

In this classification, the Census of Manufactures gives no description of the industry, assuming that the title is self-explanatory. Chart VI shows the seasonal curves of employment in this industry as derived from the Census data, the Federal Reserve indices, and J. F. Dewhurst's figures for Pennsylvania. These three curves show general agreement in the direction of their movements but differ in amplitude. Except for the months of October and December the Census and Federal Reserve curves agree exactly in the direction of the fluctuations but the amplitudes of the fluctuations in the latter are much greater, having a range of 13.4 per cent and an average deviation of 2.9 per cent, contrasted with a range of 5.1 per cent and an average deviation of 1.2 per cent in the Census indices. This difference is partly accounted for by the fact that the Federal Reserve Board reports the industry as one of changing seasonal characteristics and the curve plotted in Chart VI is for 1929. The Census data, however, do not confirm this claim of a changing seasonal, for although the monthly relatives are not so closely grouped as might be desired, evidence of a progressive change is lacking. The Pennsylvania figures show a less close agreement, partly because of the smaller territory covered and partly because the classification includes cigars and cigarettes as well as the chewing, smoking, and snuff tobaccos.

Disregarding the minor fluctuations, the seasonal curve of employment shows a period of low activity during the spring and early summer months, with an increase during the fall and early winter succeeded by a decline in midwinter. This pattern is determined by the seasonality of tobacco cultivation. During the spring and early summer the stocks of tobacco are low and with the maturing of the crop in the late summer, the supply of raw materials is replenished and employment increases.

Tobacco: Cigars and Cigarettes

Employment in the manufacture of cigars and cigarettes is at a minimum during the spring and early summer, owing to the exhaustion of the old crop of tobacco. With the maturing of the new crop employment increases, rising steadily to a peak in November and falling off in December and January. The fall activity results from the maturing of the crop and an anticipation of Christmas demand. The decline in January is probably the result of the overstocking of smokers with gift tobacco at Christmas. When this supply is con-

TABLE 2

RANGES AND AVERAGE DEVIATIONS OF THE SEASONAL INDICES IN THE FOOD AND TOBACCO INDUSTRIES

Industry	Census		Federal Reserve Board		Pennsylvania		Ohio	
	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.
FOOD								
Beverages	43.5	13.8	...	...	...	...	...	...
Bread	4.4	1.3	5.6	1.4	5.0	1.2	5.4	1.7
Butter, Cheese, etc.	31.6	9.6	...	...	...	...	25.6	7.7
Canning, Fruits and Vegetables	212.3	60.5	...	...	...	...	...	...
Canning, Fish and Oysters	70.2	23.6	...	...	...	...	...	...
Confectionery	32.4	10.2	33.0	11.0	20.0	6.0	...	...
Flour	12.4	3.7	9.0	2.3	...	...	...	...
Food Preparations	18.2	5.0	...	...	...	...	...	...
Ice Cream	49.8	16.0	34.9	11.1	40.0	12.2	...	...
Ice, Manufactured	69.0	23.6	...	...	...	...	...	...
Slaughtering	13.9	3.8	9.1	2.1	6.0	2.3	16.5	4.1
Sugar Refining	21.7	6.2	13.5	3.3	39.0	8.5	...	...
TOBACCO								
Cigars and Cigarettes	7.8	2.1	14.8	3.0	12.0	1.5	9.3	3.0
Chewing and Smoking	5.1	1.2	13.4	2.9	12.0	1.5	...	...

sumed, normal demand revives, producing increased employment in February and March.

Chart VI gives the seasonal indices for Ohio and Pennsylvania as well as the Federal Reserve and the Census indices. There is a general agreement as to seasonal pattern but considerable difference in the amplitudes, resulting from the same causes as have already been discussed in connection with chewing, smoking, and snuff tobaccos. However, the agreement of the Pennsylvania indices with those of the Census is much closer here than in the case of chewing, smoking, and snuff tobaccos, indicating that the Pennsylvania sample included a large proportion of cigar and cigarette manufacturing.

Summary

With the exception of the manufacture of bread and other bakery products, all the food industries are characterized by wide seasonal fluctuations in the number of employees. Climate, affecting either the supply of raw materials, or alternately stimulating and depressing demand, is the dominating factor, those industries depending on the maturing of the perishable fruit and vegetable crops being most strongly affected, with the industries the demand for whose products is stimulated by temperature changes ranking second in intensity of seasonal response.

The manufacture of confectionery, and to some extent the manufacture of bakery products, is affected by buying habits rather than climate, the celebrations at Christmas and Easter being the important stimuli for increased production.

The tobacco industries, like certain of the food industries, derive their major seasonal fluctuations from the maturing of the crop. The relatively non-perishable nature of the product, however, produces seasonal variations of smaller amplitude than are to be found in the food industries.

A comparison of the ranges and average deviations (Table 2) of the seasonal movements as measured by the Census, Federal Reserve, Ohio, and Pennsylvania indices fails to

reveal complete uniformity of relationship. With but one exception the state indices are characterized by larger ranges than the Census indices, but a comparison of the Federal Reserve and the Census figures, shows that a larger seasonal range is no more common to the one than the other. It is to be expected that smaller samples would show wider ranges of fluctuation. The failure of the Federal Reserve indices to show greater ranges throughout is probably due to some peculiarities of the samples.

CHAPTER III

SEASONAL VARIATIONS IN EMPLOYMENT IN THE TEXTILE, LEATHER, AND RUBBER PRODUCTS INDUSTRIES

The textile classification used by the Bureau of the Census, embraces thirty-seven groups of industries, with 1,627,141 wage earners reported in 1925. In the value of their products, the textile industries rank second, being exceeded only by the food industries, but in the number of wage earners employed they rank first, exceeding the next largest group, lumber and allied products, by 675,996 workers.[1] The industries in this group divide themselves naturally under three principal headings: first, those engaged in spinning, weaving, dyeing and finishing, and other preparatory processes; second, those which are principally employed in the cutting or manufacture of wearing apparel for men and women; and third, those occupied primarily in the manufacture of miscellaneous textile products, such as bags, blankets, artificial leather, awnings, etc. For the purpose of studying the seasonality of employment, this classification is useful since it permits a comparison of the importance of seasonal influences in the preparation of raw materials as contrasted with the manufacture of finished products, and further makes possible a comparison of the seasonal fluctuations in the manufacture of wearing apparel with the seasonal variations in the manufacture of other textiles which are less affected by personal needs and tastes. Throughout the remainder of this chapter an effort will be made to maintain the identity of these three groups for discussion purposes, although in the graphic presentation of the seasonal

[1] The figures quoted are taken from the *Biennial Census of Manufactures, 1925.*

indices some slight variations were introduced for the sake of compactness in presentation.

Of the thirty-seven industries which comprise the textile group, only seventeen reported an average number of wage earners in excess of ten thousand for the year 1925, but these seventeen employed 1,583,575 workers, or 97.3 per cent of the total, and hence constitute by far the most important part of the group. To these seventeen industries which are regularly included within the textile group have been added two others, the manufacture of mattresses and bed springs, and the manufacture of buttons, because of their close affiliation with the textile industries either in the sources of their raw materials or in the utilization of their products. These nineteen industries were studied to determine the presence and extent of seasonal variations. Without exception, each of them showed a response to seasonal influences, though in the case of several of them, notably silk goods, the seasonal swing was of very low amplitude and the pattern none too well defined.

In addition to the textile industries, this chapter discusses four others, which are engaged in the manufacture of (1) rubber boots and shoes; (2) leather boots and shoes; (3) tanned, curried, and finished leather; and (4) trunks and valises. With the exception of leather, the demand for these products is closely allied with the demand for wearing apparel and therefore these industries may properly be grouped with textiles.

Raw Materials and Preparatory Processes

Five industries have been included in this division—cotton goods, silk goods, woolens, worsteds, and the dyeing and finishing of textiles. These industries are all primarily engaged in the preparation of raw materials for a further stage of manufacture.

Cotton Manufactures

The cotton-manufactures group comprises three industries, namely: (1) cotton goods, (2) cotton small wares, and (3) cotton-lace goods.

The cotton-goods industry, which is by far the most important, embraces mills engaged primarily in any of the processes preparatory to spinning, in spinning or in the weaving of piece goods. (Manufactures of cotton knit goods are not included, being classified in the "Knit goods" industry.)

The cotton-small-wares industry is made up of mills engaged in the weaving of tape, webbing, figured labels, banding, belts, belting, trimmings, edgings, etc., or the making of flat and round braids, including shoe and corset laces. Some of these mills produce their own yarns, but the majority purchase them from establishments in the cotton-goods industry.

The principal products of establishments in the third industry are machine-made cotton-lace goods. Nearly all of the mills in this industry purchase their yarns, some of which are necessarily imported. The imported yarns are used chiefly on the Nottingham lace curtain, levers lace, and bobbinet machines.[2]

The seasonal indices which are presented in Table 3 and Chart VII are for the cotton manufactures group as a whole. Unfortunately, the Bureau of the Census has recognized only since 1923 the division of cotton manufactures into the three groups mentioned in the preceding paragraphs. Hence, though separate figures on monthly employment in the three divisions are available for the years 1923 and 1925, it seemed unwise to attempt to establish a seasonal index based on only two observations. An examination of the data for these two years does not indicate the nature of the seasonal patterns.

The seasonal swing for the whole group, however, though of small amplitude is fairly well defined. It consists of a high point in January with a gradual decline until August followed by a somewhat more rapid upswing until the peak is again reached in the following January. A comparison with the indices computed by J. F. Dewhurst for Pennsylvania and by the Federal Reserve Board for the entire country shows essentially the same pattern with slight differences in amplitude. The range for the Census indices is 4.1 per cent, for the Federal Reserve Board figures, 6.9 per cent, and for J. F. Dewhurst's Pennsylvania data, 8.0 per cent. The average deviations for these three are, respectively,

[2] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 229.

TABLE 3

SEASONAL INDICES OF EMPLOYMENT IN THE TEXTILE, LEATHER, AND RUBBER PRODUCTS INDUSTRIES, BASED ON U. S. CENSUS DATA, 1904–1925

Industry	Average Number Employed 1925	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range	Average Deviation
RAW MATERIALS AND PREPARATORY PROCESSES															
Cotton Manufactures	468,352	101.7	101.4	101.4	100.9	100.4	99.7	98.3	97.6	98.0	99.3	100.2	101.1	4.1	1.2
Dyeing and Finishing	70,749	99.9	100.7	102.2	101.9	100.3	98.7	98.0	97.2	98.5	100.2	101.3	101.1	5.0	1.3
Silk Goods	132,509	96.9	98.8	100.5	101.2	101.2	99.3	100.0	100.6	100.2	101.3	100.0	100.0	4.4	.8
Woolen Goods	98,168	100.7	101.1	102.8	102.6	102.7	101.0	98.8	96.7	98.2	98.7	98.1	98.6	6.1	1.8
Worsted Goods	67,056	102.3	102.7	103.1	101.8	99.9	97.9	96.3	96.6	98.1	100.2	101.6	99.5	6.8	2.0
FINISHED PRODUCTS															
Men's Wear															
Men's Clothing	174,332	97.2	99.3	101.1	99.3	98.8	99.5	99.4	100.6	101.9	102.2	101.1	99.6	5.0	1.2
Men's Furnishing Goods	21,094	94.1	97.0	99.8	99.5	98.6	97.9	97.7	97.4	100.9	105.0	106.8	105.3	12.7	3.0
Shirts	49,864	97.5	98.7	99.4	100.0	100.4	99.0	97.3	96.7	99.0	102.7	104.6	104.7	8.0	2.0
Women's Wear															
Corsets	14,525	96.1	98.8	102.7	103.6	103.1	100.8	99.5	99.7	101.9	100.8	97.7	95.3	8.3	2.2
Millinery and Lace Goods	53,603	101.2	110.9	114.1	106.9	95.6	87.2	89.5	99.9	104.5	101.1	94.7	94.4	26.9	6.4
Women's Clothing	126,466	94.6	103.9	109.3	105.8	96.9	91.8	90.2	97.8	106.9	107.8	101.1	93.9	19.1	5.8
Miscellaneous Apparel															
Knit Goods	186,668	97.3	98.1	99.1	99.7	100.5	100.8	99.2	99.5	100.3	102.1	102.3	101.1	5.0	1.2
Buttons	11,513	100.3	102.8	103.5	101.3	99.3	97.4	94.5	96.8	96.9	100.7	102.3	104.2	9.7	2.5
Fur Goods	16,556	80.5	79.9	84.3	86.9	91.0	96.2	101.3	108.0	117.1	122.2	121.1	111.5	42.3	13.5
Hats, Fur-felt	15,156	95.7	93.8	95.6	92.9	92.9	97.2	103.4	105.6	106.1	106.6	105.4	104.8	13.7	5.3
Miscellaneous Textile Products															
Bags	11,404	96.6	96.3	97.3	97.4	95.9	98.0	101.4	104.5	105.1	105.4	102.9	99.2	9.5	3.2
Carpets and Rugs	33,886	100.9	101.6	101.5	100.1	100.1	100.3	98.1	98.5	98.8	99.4	99.8	100.9	3.4	.9
Cordage and Twine	15,400	102.8	103.6	105.0	102.8	101.0	98.6	96.8	92.5	95.0	99.5	100.2	102.2	12.5	2.9
Mattresses and Bed Springs	14,403	91.3	92.7	96.5	98.8	100.7	101.4	99.2	100.1	105.3	108.4	105.4	100.2	17.1	3.6
LEATHER AND RUBBER PRODUCTS															
Boots and Shoes, Leather	206,992	99.0	101.5	101.5	99.3	98.2	97.5	98.7	101.0	101.8	102.0	99.8	99.7	4.5	1.3
Boots and Shoes, Rubber	24,999	101.3	100.3	101.5	98.8	98.2	98.0	95.9	94.2	100.3	102.3	104.5	104.7	10.5	2.5
Leather	53,043	99.1	100.3	100.7	98.7	98.0	100.2	99.4	99.2	99.9	100.9	101.1	102.5	4.5	1.0
Trunks and Valises	10,348	90.5	95.8	99.7	100.5	101.1	101.2	102.4	103.5	103.8	104.2	101.7	95.6	13.7	3.1

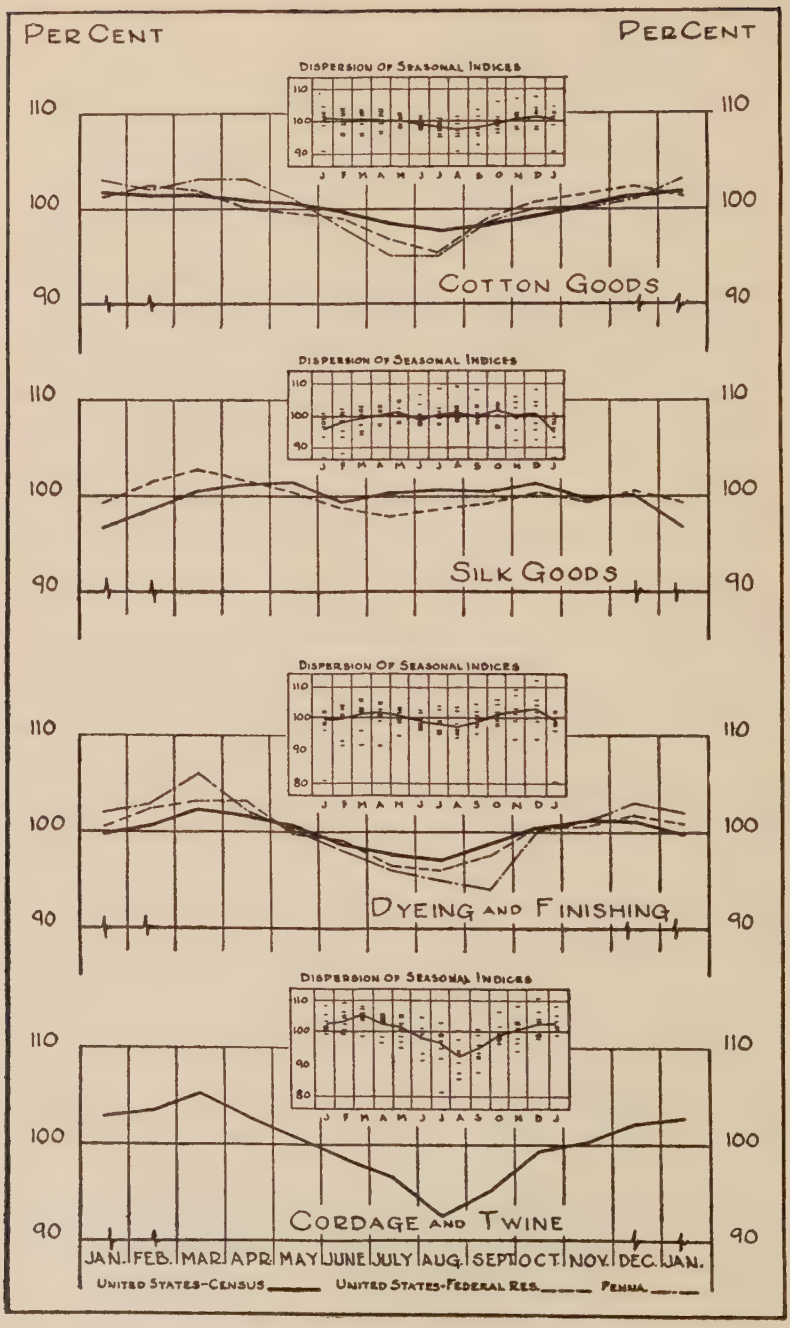

CHART VII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF COTTON GOODS, SILK GOODS, THE DYEING AND FINISHING OF TEXTILES, AND THE MANUFACTURE OF CORDAGE AND TWINE.

1.2 per cent, 1.8 per cent, and 2.1 per cent. These differences may be accounted for in several ways: first, the time interval studied is not identical for the three; and secondly, both the Federal Reserve Board indices and J. F. Dewhurst's figures are derived from smaller samples than the Census figures. It is reasonable to expect a somewhat greater fluctuation in data derived from a small sample than in data covering the most complete enumeration available, because of the smaller opportunity for cancellation resulting from the combination of diverse regional seasonal swings.

The Federal Reserve Board notes the presence of a changing seasonal for the group, and the indices shown on Chart VII are for the year 1929. A study of the Census data gives no evidence of a change in the seasonal pattern or amplitudes. It is quite possible that the changes noted by the Federal Reserve Board arise from a progressive change in the size of their sample, rather than from a real variation in the seasonal amplitudes.

The shape of the seasonal pattern is the result of two factors. First, all of the textile industries manufacturing finished products except bag-making are characterized by a summer decline and relatively high activity in the fall, winter, and spring; hence the seasonal pattern is partly a reflection of the seasonal demand for finished goods. Secondly, the seasonal curve depends also on the supply of cotton, employment being lowest in the summer months when the preceding year's crop is nearly exhausted and rising in November and December as the new crop comes on the market. The low amplitudes may be accounted for by the wide diversification of products, which tends to create stability.

Dyeing and Finishing Textiles

This classification is applied to all establishments engaged primarily in such operations as bleaching, dyeing, mercerizing, printing, or otherwise converting yarn or cloth, without regard to the kind of fiber; beaming or winding yarns; or spooling thread (except winding and warping silk).

The majority of the establishments classified in this industry

specialize in this kind of work, which is usually performed on a contract or commission basis, so that the value of products for the industry represents, in the main, the amount charged for performing the dyeing and finishing processes, and the cost of materials is made up chiefly of the cost of chemicals and dyestuffs.[3]

The dyeing and finishing of textiles is closely related to all of the other industries engaged in the preparatory processes of textile manufacture; therefore it is to be expected that the seasonal pattern of employment would be similar. Chart VII shows the usual textile seasonal pattern with the spring peak occurring in March and the fall peak in November. The two months of lowest activity are January and August. The causes of this seasonal movement are directly traceable to the seasonal variations in the other textile industries. Dyeing and finishing, although a preparatory process, stands between the weaving of the cloth and the manufacture of finished goods. Therefore, the seasonal peaks tend to succeed the peaks in the weaving industries and to precede the activity in the manufacture of finished goods, the fluctuations agreeing more closely in point of time in the latter case. This relationship is shown most clearly in the spring peaks. For example, the cotton goods industry has its maximum in January, dyeing and finishing, in March, and the manufacture of men's shirts, in May. In the fall, however, dyeing and finishing fluctuates more closely with the manufacture of shirts. It would be desirable to make this comparison for other finished products than shirts, but unfortunately this represents the only Census classification which can be identified as indicating the manufacture of predominantly cotton products.

J. F. Dewhurst's indices for Pennsylvania and the Federal Reserve indices are also given on Chart VII. There is almost complete agreement as to seasonal pattern with the Census curve, there being only two points of difference. The Pennsylvania figures show the low point of summer activity in September, and both the Pennsylvania and the Federal Reserve show the fall maximum in December. These differ-

[3] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 256.

ences can be accounted for by the territory included in the Pennsylvania study, and differences arising from sampling.

As in the case of cotton manufactures, the Federal Reserve Board reports the presence of a changing seasonal factor. The Census figures give no evidence of this change. An inspection of the dispersion chart shows the values to be closely grouped. The few extreme cases occurred in 1919 and 1921, and in both years the industry was disturbed by the problems of post-war readjustment. Again the question may be raised as to whether the observed change in the seasonal indices may not arise from a progressive change in the size of the sample used by the Federal Reserve Board.

There are some differences in the amplitudes of the swings of the three sets of indices, the Census indices showing a range of 5.0 per cent and an average deviation of 1.3 per cent. The Federal Reserve and the J. F. Dewhurst indices show ranges of 7.0 per cent and 12.0 per cent respectively, with average deviations of 1.9 per cent and 2.8 per cent.

Silk Manufactures

> The industry embraces two classes of establishments: (1) Those engaged primarily in the manufacture of silk fabrics and other finished silk products, not including knit fabrics, hosiery, and other knit goods made of silk; (2) those engaged primarily in the manufacture of silk yarn, known technically as organzine, tram, hard or crêpe twist, and spun silk, and of warps.[4]

As in the case of cotton manufactures, the silk manufacturing group comprises a large number of establishments with widely diversified products. Seasonal indices for employment in the manufacture of silk goods are presented in Table 3 and Chart VII. There is some doubt as to whether this index of seasonal variation furnishes really a satisfactory picture of the seasonal pattern. Inspection of the small chart showing the dispersion of the monthly relatives about their means fails to show as satisfactory a concentration as might be desired, so that any interpretation must be cautiously made. The Federal Reserve Board indices, however, show

[4] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 303.

a generally similar pattern; hence it is possible that the indices given have a greater validity than is indicated by the scatter diagram.

The seasonal range is small, being only 4.4 per cent in the Census indices and 4.9 per cent in the Federal Reserve Board figures. The average deviations for the two series are .8 per cent and 1.1 per cent.

The characteristics of the seasonal movement are a low point in January, followed by a rise until May, a decline from May to June with an uneven upward trend until October, followed by a similarly uneven drop until January. This pattern follows the seasonal movements of employment in the women's clothing industry more closely than any other and is probably a reflection of the seasonal demand there.

Woolen Goods and Worsted Goods

The manufacture of woolen goods and the manufacture of worsted goods are treated as separate industries, and each establishment engaged primarily in the production of either class of goods is assigned to one industry or the other according to the character of its products of chief value. Woolen goods are made of carded yarns, the fibers of which are to some extent crossed. Worsted goods are made of combed yarns, from which the short fibers have been removed and the long fibers left in a more or less parallel condition.[5]

Seasonal indices are presented for both woolen goods and worsted goods in Table 3 and Chart VIII.[6] The seasonal patterns of these two closely allied industries are quite similar, though the summer lull in activity begins approximately two months later in woolen goods than in worsted goods and continues for about two months after the worsted goods have returned to normal activity. Both of them show about the same range of variation; for woolens it is 6.1 per cent and for worsteds 6.8 per cent. Their average deviations are also about the same, being 1.8 per cent and 2.0 per

[5] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 377.

[6] In the calculation of the seasonal indices for woolens and worsteds the monthly relatives for the years 1919 and 1921 were omitted because of the post-war conditions in the industry. No other monthly relatives were omitted.

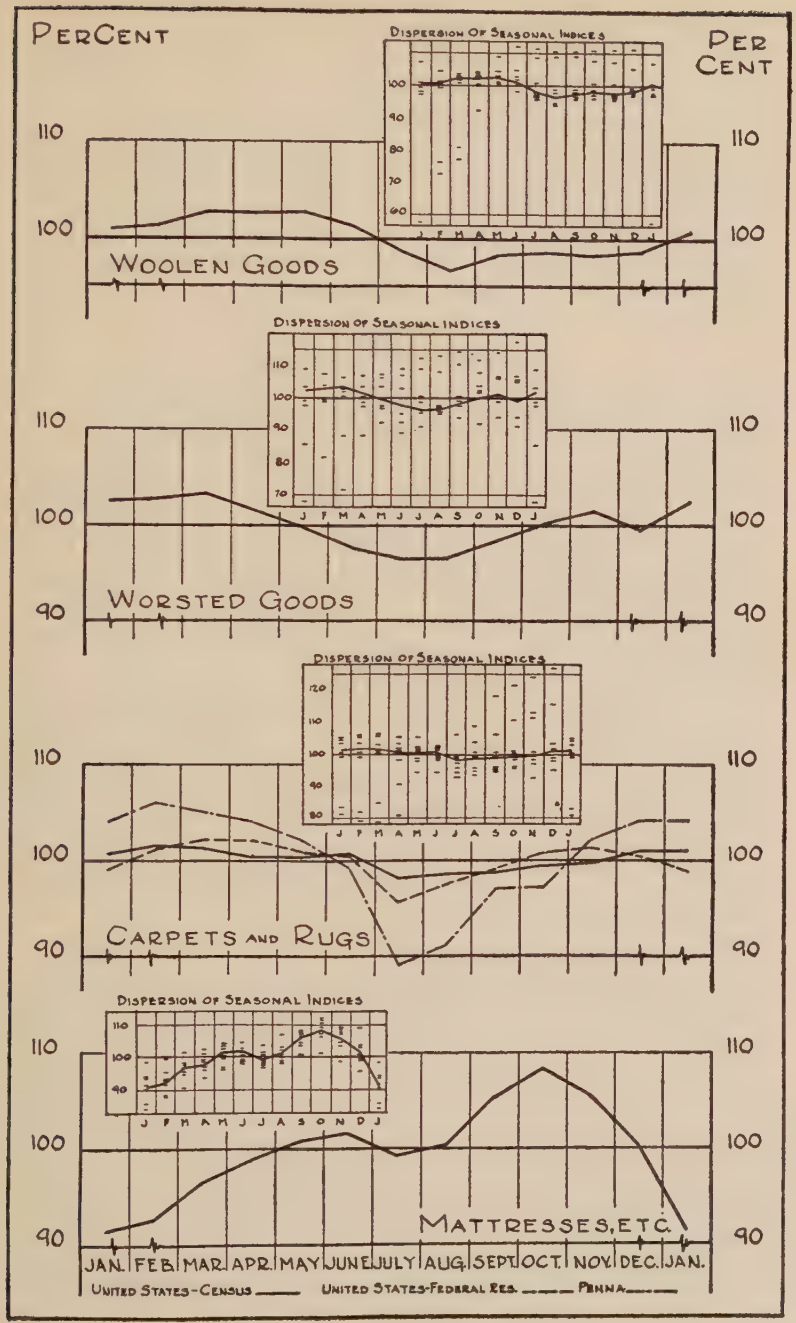

CHART VIII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF WOOLEN GOODS, WORSTED GOODS, CARPETS AND RUGS, AND MATTRESSES AND BED SPRINGS.

cent. Both reflect the seasonal demand for clothing although worsted goods follow this much more closely, as may be expected, since by far the largest number of men's and women's suits are made from this material.

Both J. F. Dewhurst and the Federal Reserve Board present indices for woolens and worsteds combined, but in view of the differences in the seasonal patterns which have already been discussed, it did not seem necessary to include their figures nor attempt a comparison.

Wearing Apparel

The textile industries engaged in the manufacture of wearing apparel group themselves into three main divisions. In the first are the industries engaged in the manufacture of wearing apparel for men, namely men's clothing, shirts, and men's furnishings. The second division comprises those industries manufacturing articles of women's wear: women's clothing, millinery and lace goods, and corsets. The industries producing miscellaneous articles such as knit goods, fur goods, fur-felt hats, and buttons constitute the third group. It is useful to retain these groupings in studying the seasonal variations in employment, since they show marked differences in the range of seasonality and also some divergencies in the seasonal patterns, particularly in the industries manufacturing the miscellaneous articles of wearing apparel.

Men's Clothing

This industry includes:

> The manufacture of all classes of men's and boys' outer clothing, such as overcoats, suits, coats, trousers, raincoats, work clothing (overalls, coveralls, unionalls, work pants, work coats, and jumpers of denim, khaki, corduroy, drills, and woolen cloth), smoking and other jackets, and all other outer garments, including bathing suits, not made in knitting mills. Hats, gloves, and mittens, footwear, and underwear are not included, these being products of separate industries. Establishments making parts of clothing, such as shoulder pads, pockets, coat fronts, and padding, are also classified in this industry.[7]

[7] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 315.

This Census classification is a heterogeneous one, including as it does a wide variety of products ranging from the standard articles of work clothing to such specialties as bathing suits and smoking jackets. With such a widely diversified production it is not surprising to find the seasonal fluctuations in the men's clothing industries of small amplitude.

In Chart IX are given the indices of seasonal variations in employment derived from the Census data, together with the Federal Reserve indices and R. J. Watkins' indices for the State of Ohio. The agreement between the Ohio figures and the Census data is close both in amplitude and pattern. Two points of difference may be noted: the low point of summer activity and the high point of the fall occur later in the Ohio figures.

Between the Federal Reserve figures and those derived from the Census data, the disagreement is pronounced, the peaks and troughs of the Federal Reserve figures occurring one or two months in advance of those indicated by the Census data. This discrepancy is difficult to explain. An inspection of the dispersion chart of the monthly relatives of the Census data shows a real grouping about the average line, and hence would tend to substantiate the validity of the figures presented here. It is entirely possible that, with as heterogeneous a classification as is used here, the difference in results may be traced to the sample used by the Federal Reserve Board. There is no reason to believe that all of the industries falling within the Census classification are subject to the same seasonal variations; hence unless the data used by the Federal Reserve Board contain samples of these industries in the same proportion as they are present in the Census classification, there is little reason to expect a complete agreement.

The seasonal pattern presented in Chart IX is largely accounted for by a seasonal demand stimulated by changes in temperature. There are peaks in the spring and fall brought about by the transfer from heavy to light weight clothing and vice versa. A comparison with Chart X for

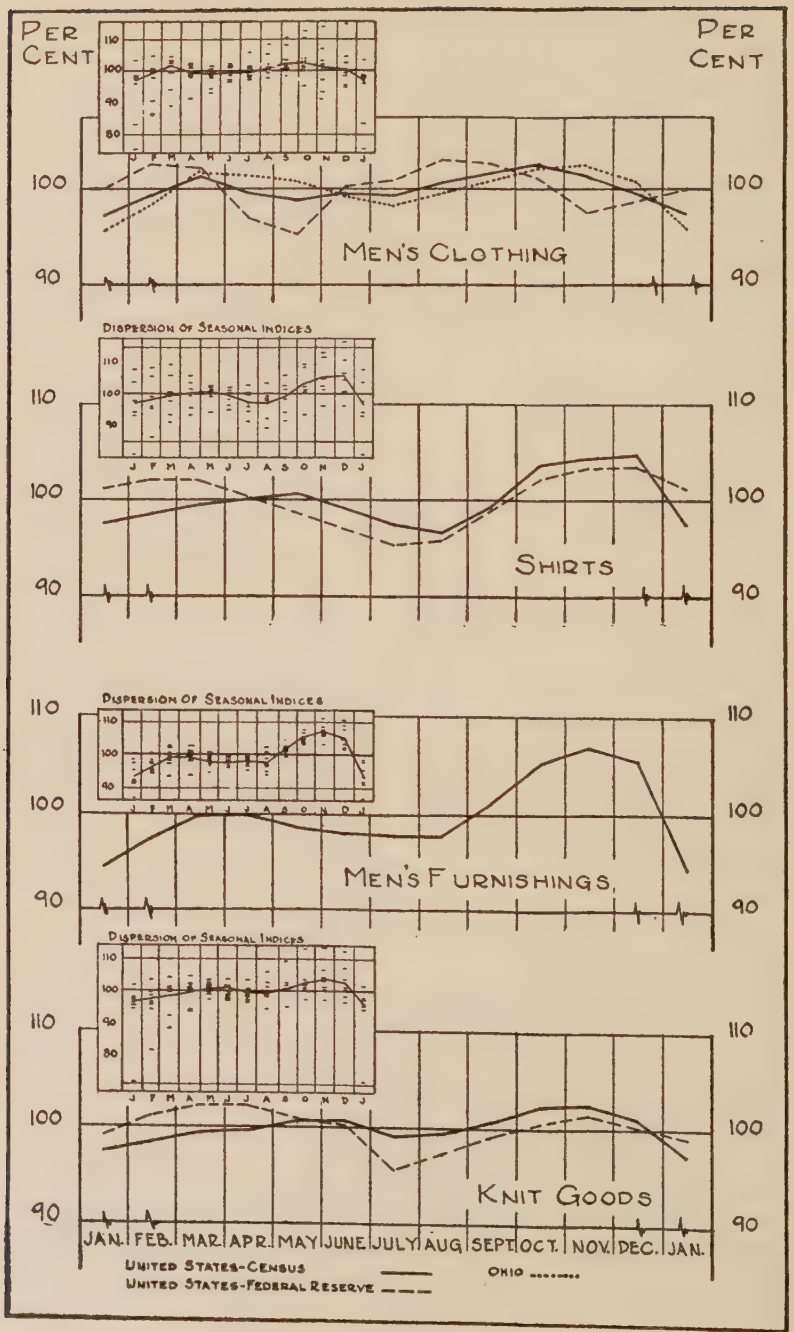

CHART IX. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF MEN'S CLOTHING, MEN'S FURNISHING GOODS, AND KNIT GOODS.

women's clothing shows a similar response to temperature changes but the variations in the latter are much more violent. The low amplitude of the seasonal variation in the men's clothing industry may be explained by the durability of the product and the smaller importance of style changes. Styles in men's clothing change slowly and a suit purchased in the fall of one year is neither worn out nor hopelessly out of style the following year. In women's clothing, however, style changes are rapid, and the materials used are in general less durable; consequently a dress purchased in the spring of one year is frequently worn out or outmoded by the following year.

Shirts

This industry includes:

> The manufacture of shirts, shirt bosoms and shirt waists for men and boys, except those made in knitting mills.[8]

Seasonal indices of employment in the manufacture of men's shirts are presented in Table 3 and Chart IX. The seasonal pattern is characterized by a minor peak in the spring of the year and a major peak in the fall. August and December are the months of least activity. The seasonal variations here can be explained as responses to a seasonal demand controlled in large measure by the changes in climate together with the sharply stimulated demand in the period just before Christmas. Shirts are almost in the same category as handkerchiefs as standard articles for Christmas giving between members of the same family. It is not uncommon for a man to receive a sufficient supply of shirts to meet his needs from one Christmas to the next, or at least to have his supply so increased that his necessary buying throughout the year is greatly reduced.

The employment indices of the Federal Reserve Board which are also shown on Chart IX show a pattern which is essentially similar to that of the Census data, the principal point of difference being that the spring peak is more pro-

[8] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 315.

nounced and occurs two months earlier. This variation may be accounted for by a difference in the size of the sample and by the fact that the Federal Reserve figures are not for the same span of years. If the second reason represents the true explanation, it would argue in favor of a changing seasonal pattern. The *Federal Reserve Bulletin* for November, 1930, has marked this industry as one of changing seasonal and the figures which are presented on Chart IX are the computed values for 1929. Yet an inspection of the seasonal indices derived from the Census data fails to show any evidence of such a change within the period for which Census data are available.

In indicating the severity of the seasonal movements, the Census figures and the Federal Reserve figures are in close agreement, the range and average deviation for the former being 8.0 per cent and 2.0 per cent, and for the latter, 8.3 per cent and 2.4 per cent.

Furnishing Goods, Men's

This classification includes:

> The manufacture of men's neckwear, belts, handkerchiefs, bath robes, pajamas, athletic underwear, etc.[9]

Seasonal variations in employment in the manufacture of men's furnishings are quite similar to those noted for the manufacture of men's shirts. There is a small seasonal peak in the spring maintaining about the same level through March and April followed by a gradual decline until August. A sharp upward swing until November follows, succeeded by a rapid decline until January. This movement is explainable by the same causes as the seasonal in the manufacture of men's shirts.

The severity of the seasonal movement is here more intense than in any textile industry so far discussed. The seasonal range amounts to 12.7 per cent and the average deviation is 3.0 per cent. This may be accounted for by the extent of the holiday demand and the conventional seasons in

[9] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 315.

the purchase of clothing. Style changes, also, are factors which tend to make the seasonal fluctuations somewhat greater.

Women's Clothing

This industry embraces:

> The manufacture of all classes of women's, girls', and children's clothing, including suits, dresses, skirts, petticoats, kimonos, dressing sacks, wrappers, jackets, capes, cloth underwear, shirt waists, linings, bathing suits (not made in knitting mills), dress shields, etc. Corsets, millinery, gloves and mittens, footwear, and knit underwear are not included, these being products of separate industries.[10]

Chart X presents the seasonal indices of employment for the industries engaged in the manufacture of women's garments. With the exception of the millinery and fur goods trades, this group shows the most acute reaction to the changing seasons. The seasonal movements are characterized by a low point in December and January followed by a rapid rise until March. From March until July there is a sharp decrease in activity succeeded by an equally rapid rise until October, when activity again declines to the low points of December and January. This pattern is a familiar one, and has been set forth numerous times in the researches of the Bureau of Labor Statistics. It is caused by the response of production to a seasonal demand which is dependent on climate. As has been pointed out in the discussion of men's clothing, the style factors and the lack of durability in the materials used in the manufacture of women's clothing are responsible for this more complete response to the changing seasons. Clothing purchased in the spring of one year is frequently discarded before the spring of the next; although in some cases the materials are not completely worn out, a radical change in the styles may make the wearing of last year's garments a cause of humiliation. This is true of style changes for all women, but it is probably a more important factor in the clothing of younger women. There

[10] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 315.

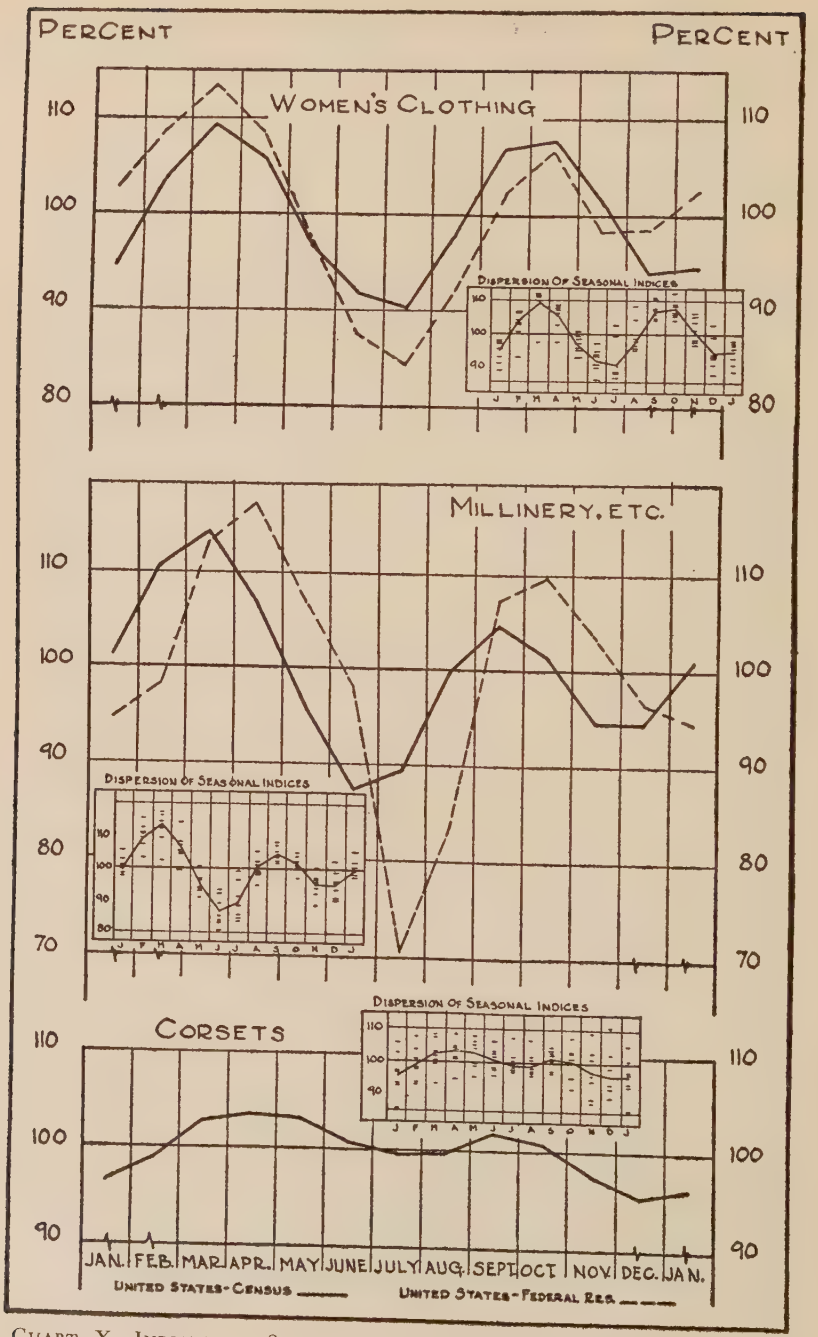

CHART X. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF WOMEN'S CLOTHING, MILLINERY AND LACE GOODS, AND CORSETS.

tends to be a complete replenishment of the feminine wardrobe yearly as the changing seasons bring with them newly dictated fashions.

In comparing the indices derived from the Census data with those of the Federal Reserve Board, it will be noted that there is complete agreement in the patterns, although the amplitudes of the latter are somewhat greater. The range and average deviation of the Census indices are 19.1 per cent and 5.8 per cent, while the Federal Reserve figures show 29.1 per cent and 7.0 per cent. These differences can probably be explained in terms of the sample used by the latter.

It is probable that the Federal Reserve figures give a better picture of the situation in local areas than those derived from the Census. The studies of the Bureau of Labor Statistics in the garment trades have indicated that although the general appearance of the seasonal pattern is the same for different sections of the country, the peaks and troughs do not occur at the same time and the intensity of the fluctuations varies in different districts; hence, when these figures are lumped together to obtain a composite picture for the entire country, the sharper fluctuations are smoothed out and the resulting indices minimize the full extent of the variations which are due to seasonal factors.

Millinery and Lace Goods

This classification embraces:

> The manufacture of embroideries, hat and bonnet frames and made hats, trimmed and untrimmed, for women and girls; dress, cloak, and millinery trimmings, braids and fringes; women's collars and neck wear; lace work, plaitings, ruchings, and veilings; crocheted goods; hand made curtains of muslin and lace; women's and children's belts other than leather; and handkerchiefs. Custom millinery shops are not included. The production of untrimmed hats for women is covered, in part, by other industry classifications, namely, "hats, fur-felt", "hats, wool-felt", "hats, straw", and "hats and caps, cloth."[11]

[11] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 315.

"Unemployment is the most important fact in the occupation of being a milliner. Twice a year more than half the workers in the trade are laid off because the short season is over".[12] In this manner Miss Mary Van Kleeck prefaces her discussion of seasonality in the millinery trades, basing her statement on the data for New York City in 1913. Reference to Chart X, based on the Census data on employment in the millinery trades, fails to indicate a seasonal movement as extreme as that found by Miss Van Kleeck, but this is perhaps due to the heterogeneity of the Census data rather than any inaccuracy in Miss Van Kleeck's statement. The Census data lumps together all divisions of the trade without regard to the character of the market. It has been shown in Miss Van Kleeck's study that the millinery trade may be subdivided into shops doing a wholesale, wholesale-retail, or a strictly retail trade, and that while the seasonal patterns are the same for all three, the wholesale-retail trade lags one month behind the strictly wholesale, and the retail trade lags one month behind the wholesale-retail. Thus the peak of spring activity in the wholesale millinery trade occurs in February, in the wholesale-retail trade, in the early part of March, and in the retail trade, about the end of March or the early part of April. This sequential relationship between the three branches of the industry is maintained throughout the year. If the employment figures for all three were combined, the composite curve would show a peak of activity in March, a low point in June, a second peak in September, and another trough lasting through November and December and the amplitude of its fluctuations would also be materially reduced.

Chart X, which presents the Census indices, shows exactly the seasonal pattern that would be expected as a result of the grouping of the three branches of the trade, and the amplitudes of the movements are smaller than those indicated by Miss Van Kleeck. The range for the Census indices

[12] *A Seasonal Industry*, Mary Van Kleeck, Russell Sage Foundation, 1917, pp. 72-73.

is 26.9 per cent and their average deviation is 6.4 per cent. These figures indicate that this is the most markedly seasonal industry that has been so far discussed in the textile group, and with the exception of the manufacture of fur goods, it stands as the most seasonal textile industry. But the figures based on the Census data are probably too conservative and if the industry were broken down into its component parts, the seasonal movement would be even more marked.

The Federal Reserve Board reports the millinery trade as one of changing seasonal characteristics and the curve shown on Chart X is for the year 1929. The seasonal pattern displayed is quite similar to that of the Census indices, but the peaks and troughs lag one month behind those of the Census curve and the amplitude of the fluctuations is appreciably greater. The range for the Federal Reserve figures is 46.6 per cent and the average deviation is 9.8 per cent. Some light on the discrepancies between the two sets of indices may be found in the preceding discussion of the three divisions of the trade. If the sample used by the Federal Reserve Board contains a disproportionate representation of retail trade it follows that the troughs and peaks of the Federal Reserve curve would lag behind those for the industry as a whole.

As regards a changing seasonal character, the Census data fail to give any evidence of a change either in the time of occurrence of the peaks and troughs or in the amplitude of the fluctuations. In six out of the seven years covered by the Census data the spring peak occurred in March; in the seventh, the maximum spring employment was in February. Without an exception the low point of activity came in the month of June. The autumn peak of employment showed slightly less consistency, since only five out of the seven maxima occurred in September. In one of the disagreeing cases the peak occurred in August, and in the other, in October. In neither case, however, did the index of the month of maximum employment exceed the index for Sep-

tember by more than 1.5 per cent. In view of the high degree of consistency displayed by the Census data, it would seem that, unless there has been a radical change in the constitution of the millinery trade since 1925, the changes noted by the Federal Reserve Board result from the nature and changing size of their sample.

The explanation of the seasonal pattern is so obvious that it scarcely demands elaboration. The two peaks in the spring and fall mark the semi-annual replenishment of the feminine wardrobe; the intensity of the fluctuations can be traced to the powerful influence of style changes, which are more marked in millinery than in any other articles of feminine attire.

Corsets

This industry includes:

> The manufacture of corsets, corset waists, brassieres, stays, and similar articles.[13]

Chart X presents seasonal indices in the manufacture of corsets and allied articles. The seasonal pattern, with a range from low to high of 8.3 per cent and an average deviation of 2.2 per cent, is the familiar one showing a period of low activity in midwinter and rising to a high point in the spring; it declines during the midsummer period of idleness and rises once more with the revival of activity in the autumn. The seasonal movements here are less pronounced than in industries manufacturing other articles of feminine attire, which may be explained by the relative insignificance of style changes. In general the pattern is a reflection of the habit of seasonal buying among women, and it corresponds closely to that of the seasonal curve for "Women's Clothing."

Knit Goods

> The classification "Knit Goods" embraces all establishments whose principle products are made by machine knitting, without regard to

[13] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 315.

whether the yarns used are of cotton, wool, silk, or other material. The knitting machinery employed is, in the main, power driven, although a few hand machines are in use.

At the census for 1921 the manufacture of all classes of knit goods was treated as a single industry, and no attempt was made to tabulate separate statistics for any group of establishments within the industry. Beginning with the census for 1923, however, four branches have been recognized, namely (1) hosiery, (2) underwear, (3) outerwear, and (4) knit cloth, and each establishment as a whole has been assigned to one branch or another, according to the character of its principal products.[14]

As in the case of cotton manufactures, it is possible to present seasonal indices only for the knit goods group as a whole. While employment figures for the four divisions of the industry are available for the Census years 1923 and 1925, it was deemed unwise if not impossible to determine a seasonal index for each division. If the Bureau of Census continues to collect data on monthly employment and recognizes the divisions outlined in the previous quotation, it will be possible at some future time to construct seasonal indices of employment for each branch of the industry.

The pattern of the employment indices reflects the seasonal demand for clothing. Chart IX shows a trough in the early part of the year, changing gradually to a minor peak in June because the industry is stimulated by the demand for certain knit goods such as sport sweaters, golf hose, and bathing suits for summer wear. After the June peak there is a sharp decline in July followed by a gradual rise to a peak in November brought about by the demand for heavy sweaters, winter underwear, and knit cloth garments for winter. A portion of this fall expansion represents preparation for the Christmas demand. From the November peak there is a rapid decline to a low point in January.

The Federal Reserve Board indices which are also presented on Chart IX agree closely as to pattern with the Census indices in the last half of the year, but the former shows the spring peak occurring in April rather than June. There is also a slight difference in the amplitudes. For the

[14] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 265.

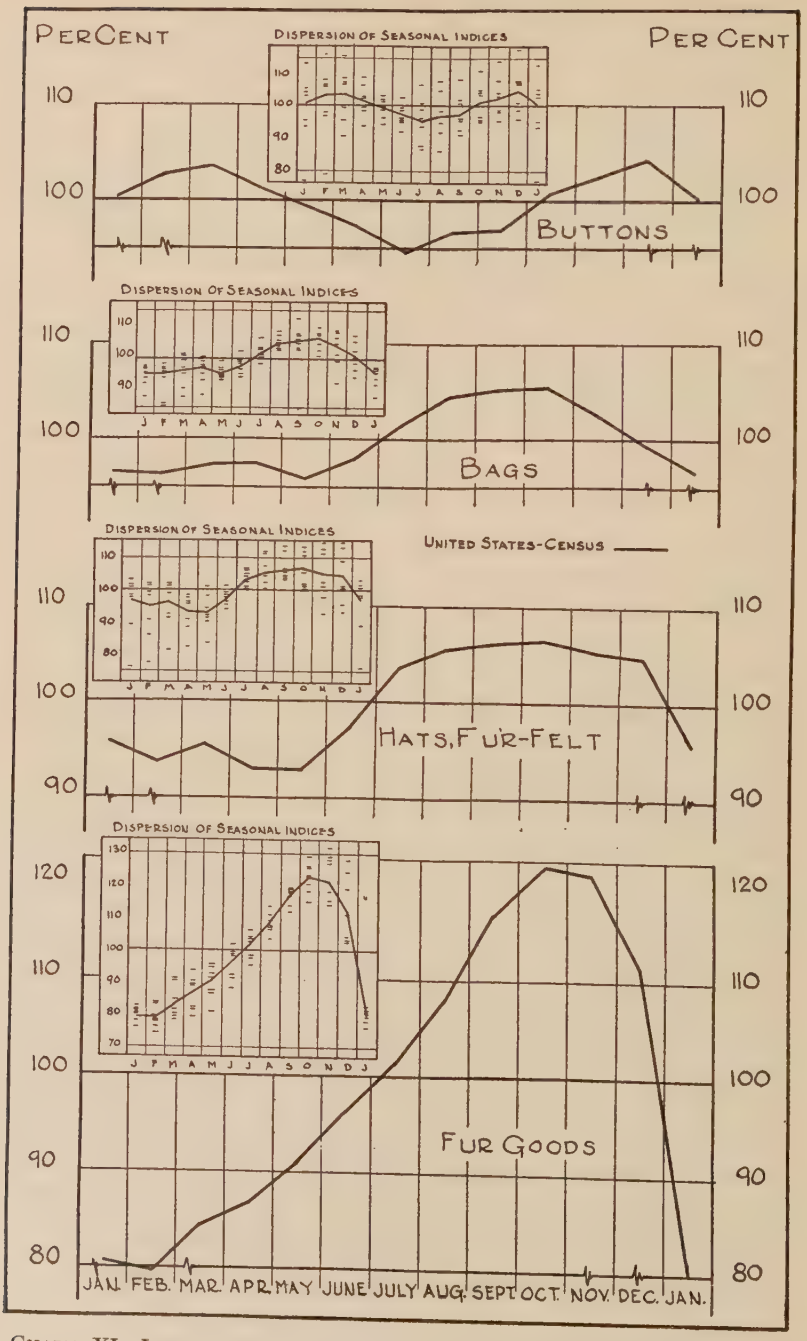

CHART XI. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF BUTTONS, BAGS, FUR-FELT HATS, AND FUR GOODS.

Federal Reserve indices the range is 6.5 per cent with an average deviation of 1.5 per cent. The indices based on the Census data show a range of 5.0 per cent and an average deviation of 1.2 per cent.

Fur Goods

This industry includes:

> The manufacture of women's, misses', and children's fur sets and furs, including boas, capes, collars and collarettes, muffs, scarfs, shawls, and stoles; fur coats and cloaks, fur and fur-lined overcoats; other garments; fur hats, caps, gloves and mittens; fur robes; and sheep-lined coats.[15]

The demands of both men and women are met by the products of this industry and hence it belongs in the category of those industries manufacturing miscellaneous articles of wearing apparel.

The seasonal indices presented in Chart XI show a very marked seasonal pattern with a range of 42.3 per cent and an average deviation of 13.5 per cent. The characteristics of the seasonal movement are a low point in February succeeded by a steady and rapid rise until October followed by an almost precipitous decline until February. The causes of these variations are directly attributable to a demand which is governed by climatic factors. Furs are essentially a protection against cold and the maximum demand appears in the late autumn, as individuals prepare to fortify themselves against the rigors of the coming winter. The intensity of the variation may be accounted for as the result of a single buying period and the durability of the product. Fur goods last the purchaser for at least one season and beyond the winter period there is no need for them.

Hats, Fur-Felt

> The establishments assigned to this industry are engaged primarily in the manufacture of stiff or soft hats (chiefly for men's wear) or hat bodies from hatters' fur. The material used chiefly is the fur of the hare. Some of the establishments perform all the various

[15] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 316.

processes, beginning with the first treatment of the raw fur, while others purchase the cut fur and still others buy the hat bodies in the rough and finish and trim them.

Establishments engaged primarily in cutting hatters' fur are not included in this industry but are classified under "Hat and cap materials."[16]

The seasonal fluctuations in employment (see Chart XI) in this industry are quite similar to those in the fur goods industry though the amplitudes of the variations are appreciably less, showing a seasonal range of 13.7 per cent and an average deviation of 5.3 per cent. The difference between the fur-felt hat industry and fur goods manufacturing rests in the smaller amplitude of the variations of the former. This may be explained by the fact that fur-felt hats are more nearly articles of year-round wear. Many people wear felt hats throughout the year, which tends to stabilize the demand and thus makes the autumn demand less of a strain on the productive capacity of the industry.

Buttons

The establishments classified in this industry are those whose principal products are buttons, parts of buttons, and button blanks and molds.[17]

Strictly speaking, the manufacture of buttons does not belong in the classification of the textile industries, but its products are so exclusively used in the various branches of the textile trade that its seasonal movements reflect the seasonal movements of textiles to a very high degree. Chart XI shows a seasonal pattern which, like that common to both men's and women's clothing, depends directly on the seasonal demand for these products. In the amplitude of the fluctuations the industry shows a range of 9.7 per cent and an average deviation of 2.5 per cent, in general standing in a middle position between the men's clothing industry and the women's clothing industry.

[16] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 262.
[17] *Op. Cit.*, p. 1165.

Miscellaneous Textiles

Only four industries in the group manufacturing miscellaneous textiles had a sufficiently large working force in 1925 to come within the scope of this study. These are engaged in the manufacture of bags, carpets and rugs, cordage and twine, and mattresses and bed springs. The last-named industry was included because of its dependence on the textile industries for a portion of its raw materials. All four of them show a well-defined reaction to seasonal influences.

Bags

This classification includes:

> Mainly jute and canvas bags for mail, coal, cement, grain, flour, meal, money, etc., bags for use by carpenters, newsboys, and fruit pickers; individual tea-service bags, etc. This industry does not include the manufacture of bags made and used by the same establishments as containers for flour, tobacco, cement, or other commodities manufactured by these establishments. The production of bags in cotton mills is included in the report for the cotton goods industry.[18]

The seasonal movement indicated by Chart XI can best be explained by the demand of the industries which use bags. The period of high activity in the grain, flour, and meal industries occurs during the summer and early fall months. Bags used for the handling of mail, coal, etc., are required at other seasons or else throughout the year, and tend to exert a stabilizing influence on production and employment, which accounts for the low seasonal range of 9.5 per cent and an average deviation of 3.2 per cent.

Cordage and Twine

> The industry designation "Cordage and twine" covers all establishments engaged primarily in the manufacture of rope, binder twine, or other cordage from any class of textile materials, including jute and flax.[19]

[18] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 408.
[19] *Op. Cit.*, p. 221.

Cordage and twine are put to such a wide variety of uses that an exact determination of the causes of seasonal fluctuations in employment is very difficult. The seasonal pattern shown in Chart VII is characterized by low employment during the summer months, followed by a steady increase which attains a maximum in March. Succeeding the March peak there is a steady decline until August, though employment remains "above average" until June. A partial explanation of the movements is to be found in the agricultural demand, which may explain the spring peak; the fall revival is probably the result of a demand from the retail trades for twine to be used in tying packages during the holiday rush.

Carpets and Rugs

This industry classification covers the manufacture of carpets and rugs (not including those made of rags) in which wool is one of the principal materials used. Such carpets and rugs are usually made with a jute, cotton, or linen back.[20]

The seasonality of employment in the manufacture of carpets and rugs shown in Chart VIII displays a pattern which indicates low summer activity with moderately high winter employment. The variation in the movements, however, is very mild, the range being 3.4 per cent and the average deviation .9 per cent. There is a general resemblance between the indices for Pennsylvania, the Federal Reserve indices, and the Census indices, although the last indicate that the fall recovery occurs at a later month than is shown by either of the other two.

Mattresses and Bed Springs

The principal products of this group are:

Mattresses filled with hair, cotton, felt, moss, or similar material; wire springs for use on beds, couches, and cots; cushions and slip-on covers other than canvas or tarpaulin.[21]

[20] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 387.
[21] *Op. Cit.*, p. 1181.

The seasonality of employment in the manufacture of mattresses and bed springs is shown in Chart VIII. The seasonal pattern shows small winter activity rising to a low peak in June, a decline to July, and a steady upward swing to October, succeeded by a drop to winter inactivity in January. The seasonal range is 17.1 per cent from the low in January to the high of October. The average deviation is 3.6 per cent.

Custom is largely responsible for the seasonality of demand. Spring and fall house-cleaning periods are normally the times when household equipment is purchased.

Summary of the Textile Group

In the preceding portions of this chapter, the seasonality of employment in each of the textile industries has been discussed, and the causes have been suggested. Some comparisons between individual industries have been made, but in the following sections, a broader comparison will be attempted and general observations set forth.

The Amplitude of the Seasonal Variations

It was pointed out at the beginning of this chapter that the textile industries grouped themselves into three divisions: those engaged in the preparatory processes of manufacture, those making wearing apparel, and those engaged in the fabrication of miscellaneous textile products. It is interesting, at this point, to refer to Table 4 and compare the range and average deviation figures in each of the groups. It will be noted that the preparatory processes in general are less affected by seasonality than the manufacture of finished products. The maximum range in the preparatory process group is 6.8 per cent. Only three of the finished-product industries show as low or a lower range; these are the knit goods, men's clothing, and the carpet and rug industries, the seasonal features of which have already been discussed in detail.

In garment manufacturing, women's attire shows, in gen-

TABLE 4

RANGES AND AVERAGE DEVIATIONS OF THE SEASONAL INDICES IN THE TEXTILE, LEATHER, AND RUBBER PRODUCTS INDUSTRIES

Industry	Census		Federal Reserve Board		Pennsylvania		Ohio	
	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.
RAW MATERIALS AND PREPARATORY PROCESSES								
Cotton Manufactures	4.1	1.2	6.9	1.8	8.0	2.1	...	...
Dyeing and Finishing	5.0	1.3	7.0	1.9	12.0	2.8	...	...
Silk Goods	4.4	.8	4.9	1.1	...	...	...	...
Woolen Goods	6.1	1.8	...	...	...	...	...	...
Worsted Goods	6.8	2.0	...	...	...	...	...	...
FINISHED PRODUCTS								
Men's Wear								
Men's Clothing	5.0	1.2	6.1	2.1	...	...	6.6	1.5
Men's Furnishing Goods	12.7	3.0	...	...	...	...	...	...
Shirts	8.0	2.0	8.3	2.4	...	...	...	...
Women's Wear								
Corsets	8.3	2.2	...	...	...	...	...	...
Millinery and Lace Goods	26.9	6.4	46.6	9.8	...	...	...	...
Women's Clothing	19.1	5.8	29.1	7.0	...	...	19.1	5.0
Miscellaneous Apparel								
Knit Goods	5.0	1.2	6.5	1.5	...	...	...	...
Buttons	9.7	2.5	...	...	...	...	...	...
Fur Goods	42.3	13.5	...	...	...	...	...	...
Hats, Fur-felt	13.7	5.3	...	...	...	...	...	...
Miscellaneous Textile Products								
Bags	9.5	3.2	...	...	...	...	...	...
Carpets and Rugs	3.4	.9	6.5	1.5	17.0	4.5	...	...
Cordage and Twine	12.5	2.9	...	...	...	...	...	...
Mattresses and Bed Springs	17.1	3.6	...	...	...	...	...	...
LEATHER AND RUBBER PRODUCTS								
Boots and Shoes, Leather	4.5	1.3	10.5	2.8	...	...	7.6	1.9
Boots and Shoes, Rubber	10.5	2.5	12.5	4.0	...	...	...	...
Leather	4.5	1.0	6.0	1.4	...	...	6.8	1.6
Trunks and Valises	13.7	3.1	...	...	...	...	...	...

eral, a more sensitive reaction to seasonal influences than men's wear; this has been explained by the differences in the durability of the materials used and the lesser importance of style changes in men's clothing.

In the miscellaneous apparel group the seasonal influence was most pronounced in the manufacture of fur goods, which had the largest range and average deviation of any industry in the entire textile group.

Another interesting comparison of magnitudes may be made with reference to the indices presented from J. F. Dewhurst's study for Pennsylvania, the Federal Reserve figures, the indices for Ohio, and the indices derived from the Census data. A glance at Table 4 will show that *with-*

out exception the Census indices show both a smaller range of fluctuation and a lower average deviation than any of the other three. In view of the explanation, offered at numerous times throughout the chapter, for the discrepancies between the Census indices and the Federal Reserve figures, this consistency is significant. This explanation has given emphasis to the fact that the Federal Reserve indices were based on a sample and that hence a greater degree of variation was to be expected. This greater variation is entirely in accord with the generally accepted theory of sampling and the consistency of relationship noted in Table 4 gives added weight to the explanation offered.

Causes of Seasonal Variation

Four factors have been noted as influencing seasonality in the textile industries. The first and most far reaching is climate, which affects the demand for the products of all industries studied. Second, it was noted that style changes, although not actually causing the seasonal movements, are an important factor in determining their intensity. This is particularly true in the industries manufacturing articles for women's wear. Third, there is a seasonality, notable in the case of bags, which is derived from the seasonality in other industries utilizing the products, which may further be traced to factors of custom, climate, and style. Fourth, custom or habits, which may or may not have become institutionalized, exert a strong influence in determining seasonal buying, Christmas and other holiday demands affording the most outstanding illustrations.

Heterogeneity of the Classifications

The classification of industries used by the Census cannot be considered satisfactory. First, too many diverse industries are classified within a single group, without any assurance that the industries so classified possess common characteristics. Under the headings of "women's clothing" and "men's clothing" for example, there are heterogeneous

collections of industries which have in common only the clientele to whom the products are sold. No distinction is made between novelties and standard articles, nor is there any distinction between wholesale and retail manufacturing or between one or the other and a combination of the two. In any attempt to measure seasonal variations, this "lumping" of industries is a complicating factor which tends to iron out the seasonal irregularities; hence the Census indices which have been offered in this chapter represent an ultra-conservative measure of the effect of the changing seasons.

Second, there appears to be an absence of any guiding principle governing the selection of industry classifications. For example, cotton goods have as their common characteristic the raw material used, but knit goods are identified by the process of manufacture without regard to the raw materials, and the wearing-apparel industries have in common only the group of consumers. Obviously, with an arrangement of industries which follows no set rule of classification, a comparison of the intensity of the seasonal movements in the different stages of production is complicated by the absence of a uniform progression through the productive process.

Rubber and Leather Products

The industries included in this division are drawn from the two Census classifications "Leather and its manufactures" and "Rubber Products." In the first of these classifications there are ten industries designated, of which but three reported an average number of wage earners amounting to or in excess of 10,000 in 1925. All three show a response to seasonal factors and seasonal indices are presented in the succeeding sections. In the "Rubber Products" group, are found three employing more than 10,000 workers, but the "rubber boots and shoes" industry was the only one for which seasonal indices could be computed. The other two industries, engaged in the manufacture of "rubber goods"

and "rubber tires and inner tubes," have been treated as separate industries only since 1921, and in the three Census years 1921, 1923, and 1925, the fluctuations in the employment data for these industries are so erratic that no seasonal pattern could be established.

Leather: Tanned, Curried, and Finished

This industry designation covers tanneries manufacturing leather from hides and skins of all kinds, domestic and imported, and establishments engaged in the currying and finishing of leather. All the products of this industry are used as materials for further manufacture, largely in other leather industries but to some extent also in the motor-vehicle, carriage and wagon, furniture, and bookbinding industries, and other industries outside the leather group.[22]

Chart XII shows the seasonal variations of employment in the preparation of leather. The pattern is characterized by a mild seasonal peak in February and March with gradual declines in April and May. June is marked by a slight increase in employment, succeeded by a decrease in July and August. The employment curve swings upward gradually from September to December.

The causes of these seasonal movements may be traced to identically the same factors as govern the seasonality in the slaughtering and meat-packing industry. Leather is actually a by-product of the production of meat, and the volume of employment in the trades engaged in the tanning, currying, and finishing of leather depends very largely on the number of hides which are available for treatment. A comparison of the seasonal indices of employment in the leather-finishing industries with those for slaughtering and meat packing, shows a very close agreement as to pattern. Every major fluctuation in the meat-packing industries is reflected in the curve for leather. The amplitudes of the leather curve are, however, much smaller than those for the meat-packing industry, which may be attributed to the stabilizing effect of imported hides, together with the possibility of storing do-

[22] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 591.

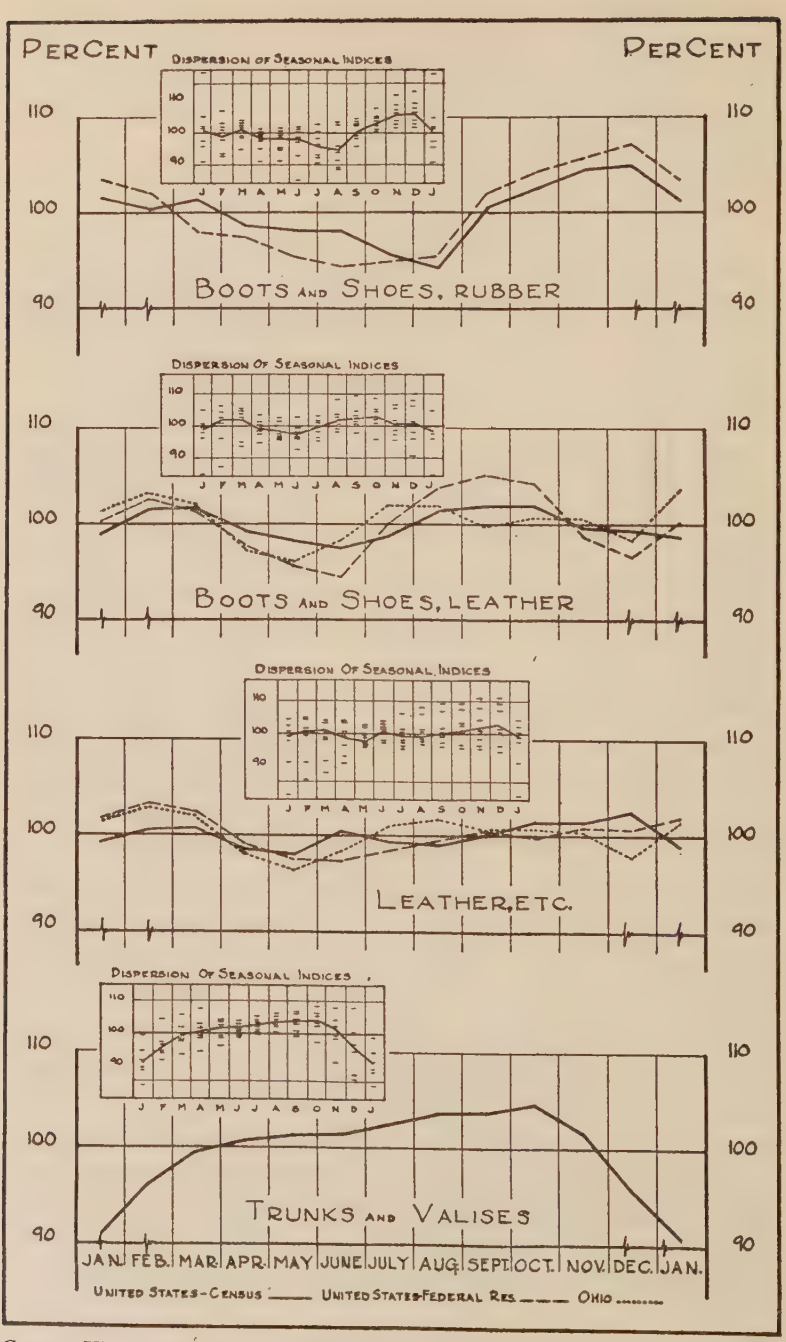

CHART XII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF RUBBER BOOTS AND SHOES, LEATHER BOOTS AND SHOES, TANNED, CURRIED, AND FINISHED LEATHER, AND TRUNKS AND VALISES.

mestic hides for limited periods before they are submitted to the tanning and finishing processes.

Curves based on the Federal Reserve and Ohio indices are also given in Chart XII. These show a general agreement as to form, range, and average deviation, with some disagreement as to details, which may be explained by the differences in samples.

Boots and Shoes, Other Than Rubber

> This industry consists in the manufacture of boots, shoes, sandals, slippers, moccasins, leggings, overgaiters, and allied footwear, chiefly of leather, although footwear made of canvas and other textiles is also included.[23]

In the discussions of seasonal movements in the clothing industries, the dominant seasonal factor noted was the transfer from light to heavy clothing in the fall and the return to lighter clothing in the spring, representing a semi-annual change which in the case of women's clothing was intensified by the importance of style changes. The seasonal fluctuations in the manufacture of leather boots and shoes are dependent very largely on these changes in clothing, and the purchase of new shoes is a part of the semi-annual change of wardrobe. In the manufacture of women's shoes, style is an important factor, but since the indices given in Chart XII are for women's, men's, and children's shoes combined, the effect of this factor is less noticeable than in the women's clothing industries.

In general, the boots and shoes curve of employment agrees with the curves for other articles of wearing apparel, showing two peaks of employment, one in March, the other in September or October, and two low points of employment, in June and January. The Federal Reserve and the Ohio indices show an essentially similar pattern of somewhat greater amplitude, but the Ohio figures indicate a decline in September which is not evident in either the Federal Reserve or the Census curve.

[23] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 598

Rubber Boots and Shoes

> The establishments classified in this industry are those whose principal products are rubber boots, shoes, overshoes, heels, and soles, and canvas shoes with rubber soles.[24]

The boots and shoes included in this classification are in general intended not for everyday wear but to serve as additional protection in inclement weather, and hence the seasonal pattern of employment differs considerably from the one for leather boots and shoes.

In the manufacture of rubber boots and shoes, the peak of employment is in December, resulting from the winter demand for rubber boots, overshoes, galoshes, and similar footwear. Since these articles are worn only as necessity demands, the durability of the product makes replacement in the same season unnecessary. Once the winter demand has been met, there is a somewhat uneven decrease in the volume of employment until the lowest level is reached in August.

The Federal Reserve indices, which are also shown in Chart XII, agree with the Census curve as to pattern but show a somewhat larger variation.

Trunks, Suitcases, and Bags

> The products of the establishments classified under this designation are trunks, valises, suitcases, traveling bags, satchels, Boston bags, carrying cases, brief cases, hatboxes, luncheon kits, etc. These products are made largely from leather, but certain other materials, such as imitation leather, canvas and fiber board, are also used.[25]

Employment in the manufacture of trunks, suitcases, and bags shows a well-defined seasonal pattern characterized by low employment in January, with a sharp increase in February and March, succeeded by a gradual rise to a maximum in October. From October to January the decline is rapid.

This seasonal movement may be explained as the result of two types of demand which overlap in the time of their

[24] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 622.
[25] *Op. Cit.*, p. 612.

occurrence. The summer months are those of maximum travel, and hence the spring revival in the manufacture of traveling equipment is an anticipation of a summer demand. With the close of the travel season, employment does not decline, for the manufacturers are then ready to work up stock for the Christmas trade. Employment continues to expand until October, by which time the retailers are stocked for the Christmas sales. Their demand slackens and the volume of both production and employment declines.

Summary for the Rubber and Leather Products Industries

Since the outstanding seasonal characteristics of the rubber and leather industries have been discussed and compared in the preceding sections, the only important point in the way of summary is a comparison of the range of variations in the different industries as measured by the Federal Reserve and Ohio indices with the range as measured by the Census indices. Table 4 shows that here, as in the case of the textiles, the amplitudes of the variations are less when derived from the Census indices than from either of the others, which further substantiates the explanation that the differences in amplitudes are probably due to sampling.

CHAPTER IV

THE IRON AND STEEL, MACHINERY, TRANSPORTATION EQUIPMENT, AND NON-FERROUS METALS INDUSTRIES

The industries to be discussed in this chapter cover four of the Census classifications of industries, "Iron and steel and their products," "Machinery, not including transportation equipment," "Transportation equipment," and "Metals and metal products." Each of these groups reported a large enough number of wage earners in 1925 to warrant separate treatment, but as the various divisions were analyzed, it became evident that only a small number of industries in each group was affected by regular seasonal influences which could be definitely identified and segregated. Hence for the purpose of securing compactness in presentation, these four classifications have been grouped together for discussion. A further justification for this grouping may be found in the dependence of all four sets of industries on iron and steel or other metals for their raw materials.

Sixteen industries in the "Iron and steel" classification reported an average number of wage earners in excess of ten thousand, and were therefore investigated to ascertain the presence or absence of regularly repeated seasonal variations in the volume of employment. In nine of these the seasonal movements were sufficiently evident to warrant the computation of seasonal indices. These nine industries were engaged in the manufacture of "Cutlery," "Hardware," "Steam fittings," "Stoves," "Structural and ornamental iron work," "Tinware," "Tools," "Wire," and "Wirework." However, the analyses of only eight industries are presented in this chapter, the seasonal indices of employment in the manufacture of structural and ornamental iron work being

presented and discussed with the industries manufacturing construction materials. The seven industries which failed to show the presence of seasonal variations comprise the following Census designations, "Blast furnaces," "Steel works and rolling mills," "Bolts, nuts, washers, and rivets," "Cast-iron pipe," "Forgings," "Wrought pipe," and "Plumbers' supplies."

The manufacture of machinery is subdivided into fourteen different industries, ten of which reported an average of more than ten thousand wage earners in 1925. Those engaged in the manufacture of "Agricultural implements," "Engines and water wheels," "Pumps and pumping equipment," "Typewriters," and "Electrical machinery and apparatus" showed the presence of seasonal movements. Industries manufacturing "Foundry and machine-shop products," "Cash registers," "Metal-working machinery," "Sewing machines," and "Textile machinery" were examined for evidence of recurring seasonality of employment but for none of them could a pattern be established.

Eleven industries in the "Metal and metal products" classification reported a sufficiently large number of wage earners to be investigated in the present study. Of these, the three engaged in the manufacture of "Brass, bronze, and other non-ferrous alloys," "Aluminum products," and "Copper, tin, and sheet-iron work" were characterized by the absence of discernible seasonal movements. Indices of seasonal variation were computed for the other eight, although the validity of the values obtained for "Smelting and refining of copper" is open to question. A study of the monthly relatives for this industry gives some evidence of seasonal variations, but the disturbing influence of the World War and the succeeding readjustment have so distorted the employment figures for the years 1914, 1919, and 1921, that the seasonal pattern is presented with some hesitation.

Two of the six industries engaged in the manufacture of transportation equipment and reporting more than 10,000 wage earners in 1925, failed to show a definite seasonal pat-

TABLE 5

SEASONAL INDICES OF EMPLOYMENT IN THE IRON AND STEEL, MACHINERY, TRANSPORTATION EQUIPMENT, AND NON-FERROUS METALS INDUSTRIES, BASED ON U. S. CENSUS DATA, 1904–1925

Industry	Average Number Employed 1925	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range	Average Deviation
IRON AND STEEL PRODUCTS															
Cutlery	16,407	98.7	101.0	102.8	102.4	100.3	99.0	95.4	96.0	97.9	101.1	103.1	102.3	7.7	2.2
Hardware	52,349	100.5	102.0	102.5	101.3	99.8	98.4	97.8	98.5	98.0	99.3	100.8	101.1	4.7	1.4
Steam Fittings	43,260	100.0	101.0	101.3	97.9	97.2	96.8	96.6	98.7	101.4	103.1	103.6	102.4	7.0	2.1
Stoves	29,376	86.6	95.2	98.4	99.3	99.4	100.3	95.3	101.6	104.9	108.5	108.3	102.2	21.9	4.3
Tin	29,901	91.1	95.2	97.8	100.8	101.9	104.7	107.0	108.1	108.6	100.3	94.7	89.8	18.8	5.2
Tools	25,340	102.8	102.4	103.3	103.6	102.6	99.1	97.4	97.8	97.6	97.6	97.5	98.3	6.0	2.4
Wire	18,544	103.8	104.5	103.2	98.7	97.4	97.3	97.4	96.9	99.2	99.1	100.3	102.2	7.6	2.3
Wirework	19,268	99.4	100.8	102.4	102.6	100.0	98.5	96.7	97.2	98.6	100.7	101.6	101.5	5.9	1.6
MACHINERY															
Agricultural Implements	28,696	108.1	112.6	112.2	108.7	101.0	96.6	91.3	89.0	86.7	91.8	98.3	103.6	25.9	7.7
Engines and Water Wheels	51,099	103.4	104.1	107.0	106.9	105.9	101.3	98.0	97.0	93.7	95.0	95.1	92.6	13.3	4.8
Pumps and Pumping Equipment	17,935	101.1	101.6	102.4	102.8	102.3	101.0	100.5	99.9	99.5	97.5	95.3	96.1	7.5	2.0
Typewriters and Supplies	14,969	103.3	102.9	105.4	104.1	102.3	99.9	97.0	88.0	95.9	99.4	100.6	101.2	17.4	3.3
Electrical Machinery	239,921	103.1	100.1	100.0	99.2	98.7	97.9	97.3	97.5	99.0	101.0	102.6	103.6	6.3	1.7
TRANSPORTATION EQUIPMENT															
Motor Vehicles	197,728	89.8	93.6	99.0	106.9	107.2	103.5	101.9	100.4	102.7	103.1	97.9	94.0	17.4	4.3
Motor Vehicle Bodies and Parts	228,382	90.1	93.4	98.4	106.7	108.2	103.1	99.3	99.6	100.7	101.1	99.9	99.5	18.1	3.3
Shipbuilding, Steel	38,308	105.6	103.5	108.2	108.2	104.9	101.7	99.1	98.0	94.3	90.0	91.4	95.1	18.2	5.4
Shipbuilding, Wooden	11,916	92.2	92.6	102.5	112.7	112.4	110.1	103.9	99.9	96.2	96.9	92.2	88.4	24.3	6.9
METALS AND METAL PRODUCTS															
Gas and Electric Fixtures	11,565	97.3	97.6	97.7	97.8	98.1	95.9	95.0	96.5	101.7	107.0	108.2	107.2	13.2	4.0
Jewelry	23,837	100.6	100.7	99.8	98.1	97.2	96.3	94.1	95.6	101.6	105.0	105.9	105.1	11.8	3.2
Lamps and Reflectors	10,769	95.0	98.9	102.3	101.7	99.1	96.8	95.6	97.0	100.0	104.5	106.0	103.0	11.0	2.9
Plated Ware	11,290	97.7	99.9	101.5	100.7	99.4	98.6	93.3	98.7	101.4	103.8	103.9	101.1	10.6	2.1
Smelting and Refining, Copper	15,588	110.2	105.4	104.6	104.5	99.5	98.5	99.9	95.8	95.0	96.1	95.5	95.0	15.2	4.1
Smelting and Refining, Zinc	11,289	104.0	102.0	101.8	99.8	99.4	98.8	97.5	96.9	98.8	98.7	100.2	102.1	7.1	1.7
Stamped and Enameled Ware	29,704	97.0	100.6	104.0	103.8	102.2	100.2	97.7	98.5	98.2	99.4	99.1	99.3	7.0	1.8
Watches, Clocks, and Parts	13,915	99.3	100.0	100.7	99.4	98.5	98.5	97.3	99.7	100.7	101.8	102.3	101.8	5.0	1.2

tern. These were employed in the making of "Locomotives, not made in railroad repair shops" and "Steam and electric cars not made in railroad repair shops." The industries engaged in the fabrication of steel ships, wooden ships, motor vehicles, and motor-vehicle bodies and parts, however, displayed a well-defined seasonal pattern in their curves of employment.

In each of the four classifications of industries which have just been outlined there were some industries which were characterized by a lack of seasonality, the reason for which is to be found in the nature of the demand for the products. With the exception of the industries manufacturing "Cash registers" and "Plumbers' supplies," all were engaged either in the manufacture of products subject to a wide diversity of uses and demands, as in the case of "Blast furnaces," "Aluminum products," and "Forgings," or else were producing equipment, as "Textile machinery" and "Locomotives," the demand for which would be influenced only by necessary replacements or cyclical expansion or contraction.

In the succeeding sections indices of seasonal variations are presented for the twenty-five industries in which the seasonal patterns were reasonably well defined.

Agricultural Implements

This industry embraces those establishments, and those only, which were engaged primarily in the manufacture of products falling into the following classes: (1) Plows and listers; (2) harrows, land rollers, and pulverizers; (3) planting machinery; (4) cultivators and weeders; (5) harvesting machinery; (6) haying machinery; (7) machines for preparing crops for market or use; (8) miscellaneous agricultural implements, such as can mills, fertilizer distributors, lime spreaders, manure spreaders, straw spreaders, seed potato cutters, stalk cutters, equalizers, hay carriers (forks and slings), tracks for hay carriers, etc.[1]

The seasonal pattern of employment in the manufacture of agricultural implements is almost exactly the reverse of the crop seasonals which were discussed in Chapter II. The

[1] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 984.

peak of employment occurs in February and March with the low point in September. Most of the articles produced by this industry are used in the preparation of the soil, seeding, or the cultivation of crops. Since this work is largely accomplished in the spring and early summer, the demand for agricultural implements precedes the summer activity.

Chart XIII also gives the Federal Reserve indices of employment and the indices for Ohio. All three curves show an essentially similar form, though the amplitude of that derived from the Census indices is considerably greater than in either of the other two cases, showing a seasonal range of 25.9 per cent and an average deviation of 7.7 per cent. Similar measures for the Federal Reserve indices and the Ohio indices show a range of 14.6 per cent and an average deviation of 4.4 per cent for the former, and a range of 14.9 per cent and an average deviation of 4.2 per cent for the latter.

Engines and Water Wheels

> This industry embraces those establishments whose products of chief value fall in any one of the following four classes: (1) Steam engines (other than locomotives) and turbines; (2) internal-combustion engines of all kinds; (3) tractors and traction engines; (4) water turbines and water wheels. Engines made for installation as parts of complete motor vehicles or other machines manufactured in the same establishments are not treated as products of the engine industry.[2]

Like many of the other Census classifications, "Engines and water wheels" includes a group of industries whose products are marketed to a widely varying group of customers and hence the reasons for the seasonal pattern displayed in Chart XIII are uncertain. This pattern is, however, fairly well established, as an inspection of the dispersion chart will show.

In terms of the value of output, farm tractors and motor-vehicle engines are by far the most important products of

[2] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1015.

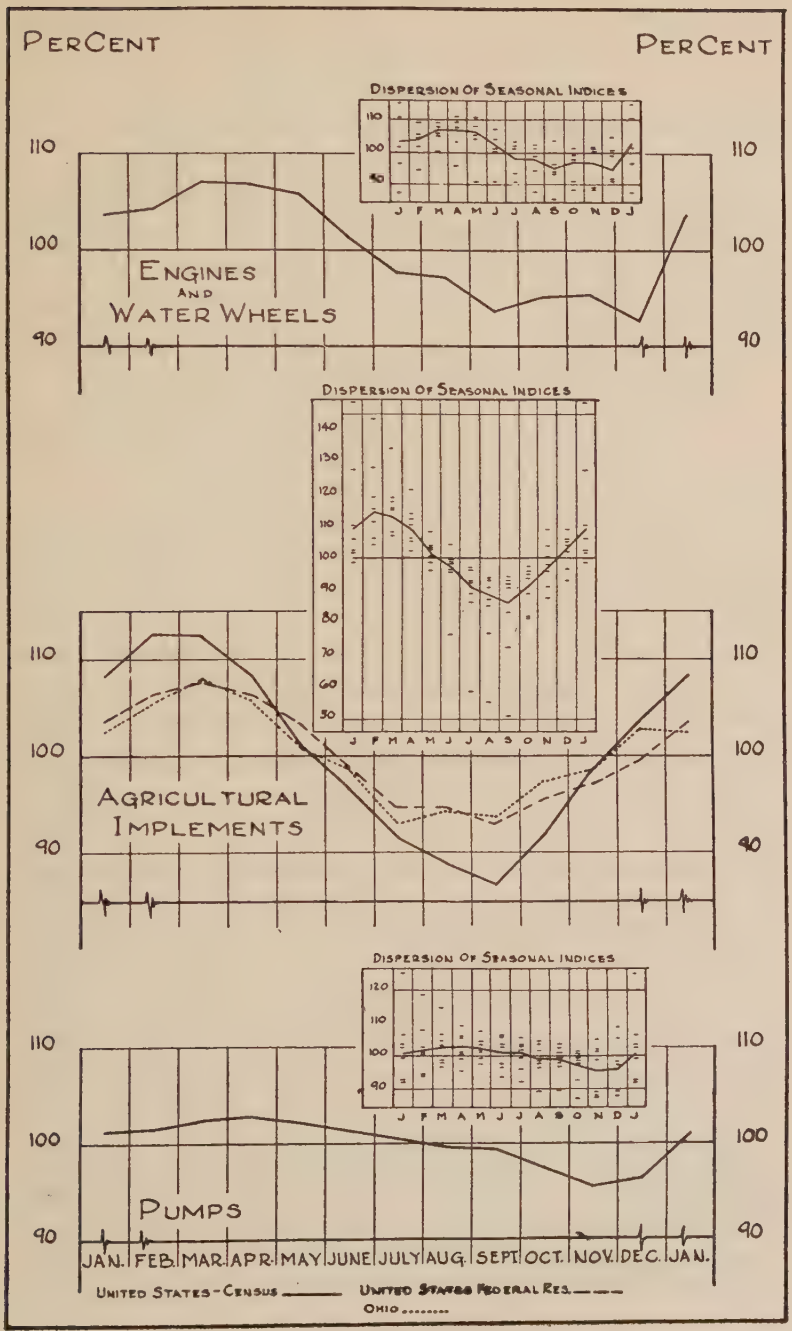

CHART XIII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF ENGINES AND WATER WHEELS, AGRICULTURAL IMPLEMENTS, AND PUMPS AND PUMPING EQUIPMENT.

the industry, accounting for nearly fifty per cent of the total. In the light of this figure it would appear that the seasonal pattern should resemble roughly an average of the curves for agricultural implements and motor vehicles. An inspection of Charts XIII and XIV shows such a resemblance, although the "Engines and water wheels" curve shows a smaller amplitude, resulting from the stabilizing effect of the other manufacturing included in this classification.

Pumps and Pumping Equipment

> This industry embraces all establishments engaged primarily in the manufacture of hand and power pumps of all kinds, such as water pumps, gasoline pumps, air pumps, oil pumps, spray pumps, and pump jacks and other pumping equipment.[3]

A study of the dispersion chart (see Chart XIII) of the monthly relatives of employment in the manufacture of pumps and pumping equipment does not show so high a degree of concentration as might be desired; hence the seasonal pattern presented must be accepted with some reservations. Part of this dispersion may be accounted for, first, by changes in classification (e.g. in 1909 steam pumps were not included) and, second, by changes in the relative importance of the various products. By 1925 gasoline-filling-station pumps had become the dominant product of the industry, accounting for about one fourth of the total. This may partly account for the seasonal pattern displayed, since the demand for such pumps would precede the summer season of automobile travel. Water pumps are more easily installed during warm weather, and if the pumping unit is large, orders must be placed in advance of the installation period to insure delivery. This would also create a spring demand. Employment is at a maximum in April and decreases steadily until November, when a gradual recovery follows until April of the following year. The amplitude of the vari-

[3] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1049.

ations is small, showing a range of only 7.5 per cent and an average deviation of 2.0 per cent.

Motor Vehicles

> The classification "Motor vehicles" applies to all manufacturing establishments whose principal products are four-wheeled motor-propelled (internal-combustion, steam, or electric) steerable vehicles, or trailers for use with such vehicles. (The manufacture of motor cycles and bicycles is treated as a separate industry.) Establishments engaged primarily in the manufacture of motor-propelled fire-department apparatus, street sweepers, road oilers, etc., are also classified in this industry. Tractors and trailers are reported as products by some of the motor-vehicle manufacturers, but . . . tractors are made principally by establishments classified in the "Engines and water wheels" industry.[4]

The seasonal production of motor vehicles results from a seasonal demand in part controlled by climate and in part by habit or custom. The summer months are the pleasantest for motoring, and motorists consider the purchase of new cars or the replacement of old ones soon after the breaking up of winter makes the roads comfortable for travel. The peak of buying comes in the spring and early summer, and hence production and employment reach their maxima in May. This seasonal demand is also stimulated by the automobile shows which are held in the winter and spring, at which time new models are offered to the public. This explanation has implied the importance of the passenger car in motor-vehicle production, an importance which is justified since in 1925 passenger cars accounted for 90 per cent of the total output.

A comparison of the indices computed by the Federal Reserve Board, by J. F. Dewhurst for Pennsylvania, and by R. J. Watkins for Ohio, with the Census indices shows a general agreement of pattern for the first half of the year. But in the latter half the Federal Reserve figures and the Census indices show a secondary seasonal peak which is not to be derived from the other two; according to the Federal Re-

[4] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1115.

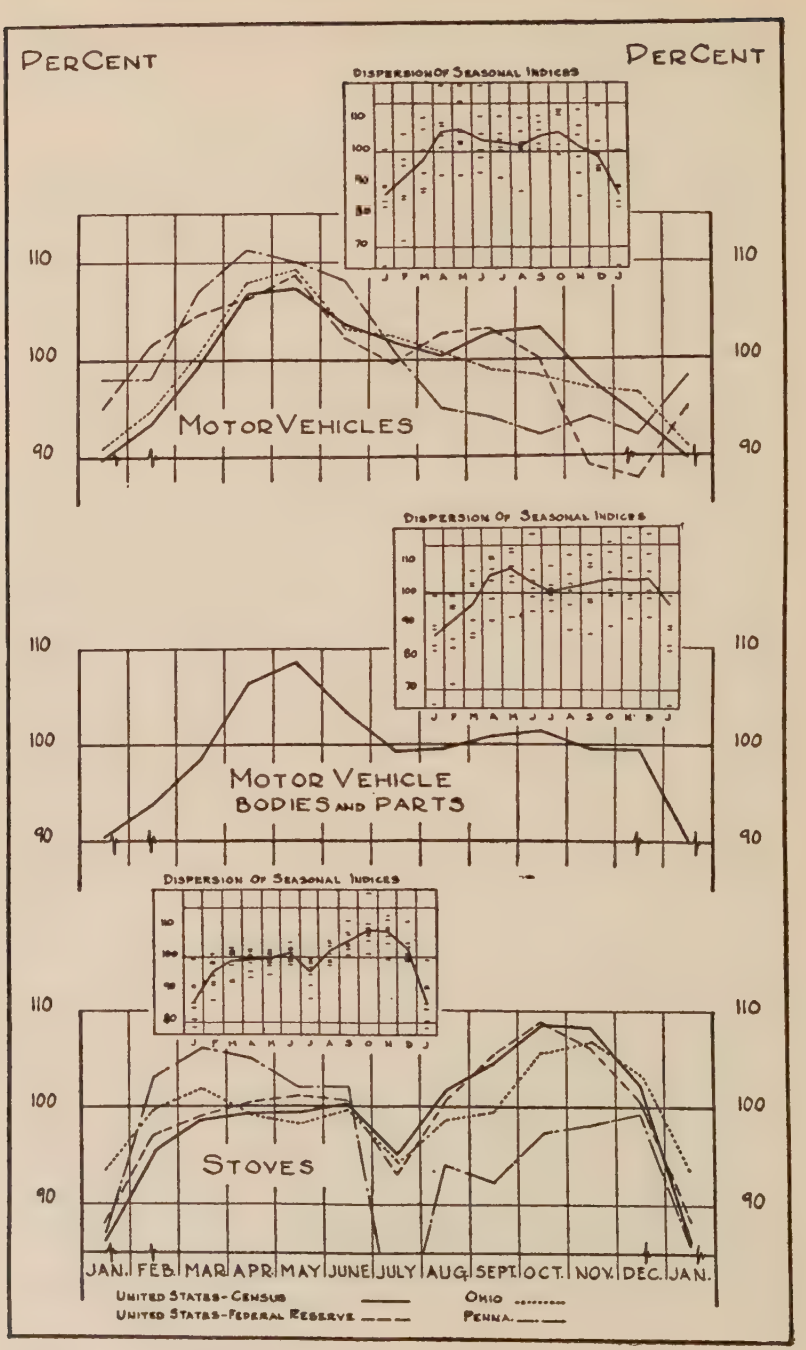

CHART XIV. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF MOTOR VEHICLES, MOTOR-VEHICLE BODIES AND PARTS, AND STOVES AND HEATING APPARATUS.

serve indices its occurs in September and according to the Census indices, in October.

A study of the dispersion chart for the Census indices shows a rather wide scattering of the yearly percentages for practically every month and hence it is quite possible that the seasonal amplitudes indicated here are not stable. Further, the Federal Reserve classifies the seasonal as a progressively changing one. It is entirely possible that such is the case, though the nature of the progressive change is not determinable from the Census data.

It should be noted, moreover, that the Ohio, Pennsylvania, and Federal Reserve figures include the manufacturing of motor-vehicle bodies and parts with the manufacture of motor vehicles. This may account for some of the differences which have been observed. However, a comparison of the Census-derived employment curves for "Motor vehicles" and for "Motor-vehicle bodies and parts" shows them to resemble each other very closely.

Motor-vehicle Bodies and Parts

> The establishments classified in this industry are those engaged primarily in the manufacture, for sale as such (or for transfer to motor-vehicle manufacturing establishments located elsewhere, but operated under the same ownership) of motor-vehicle bodies, tops, gears (transmission, differential, timer, and steering), rims, frames, wheels, radiators, windshields, axles, bumpers, shock absorbers, sheet metal for automobiles (such as fenders, dust shields, hoods, or bonnets), and various other assemblies *except complete chassis*, and parts. The manufacture of certain other assemblies or parts, of which the most important are engines, motors for electric vehicles, tires, springs, ignition apparatus, batteries, and starting and lighting systems is not, however, included in this industry.[5]

The pattern of seasonality in employment (Chart XIV) in the manufacture of motor-vehicle bodies and parts closely resembles the curve for "Motor vehicles," both in form and amplitude. The influences which make for seasonality in this industry are identical with those for "Motor vehicles" and further discussion is unnecessary.

[5] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1124.

Stoves

This group comprises three industries whose primary products are, respectively, (1) steam fittings and steam and hot-water heating apparatus; (2) gas and oil stoves and appliances; and (3) stoves (other than gas, oil, or electric) and warm-air furnaces. The products of the first industry are steam and hot-water heating boilers, radiators, safety valves, vacuum gauges, heat regulators, coils, unions, flanges, and similar fittings, and other classes of steam specialties. Those of the second are stoves, ranges, heaters, and burners designed to consume gas, oil, alcohol, acetylene, and gasoline; flatirons heated with alcohol or other fuel burned internally; gas and oil appliances for heating water for kitchen or household use, and other gas-burning heating and cooking appliances. The products of the third are cast-iron, sheet-iron, and wrought-steel stoves and ranges, warm-air furnaces, auxiliary and ventilating heaters, and stove and furnace parts. The manufacture of electric stoves, ranges, and heating appliances is treated for census purposes as part of the "Electrical machinery, apparatus, and supplies" industry.[6]

The manufacture of stoves and heating apparatus responds to a seasonal demand which is controlled partly by climate and partly by habit or custom. The graph of the seasonal indices of employment shown on Chart XIV indicates a low point in midwinter, a minor seasonal peak in June, a summer low point in July, and a rapid rise to the peak of employment in October and November.

The autumn maximum is explained as a result of the general effort to prepare for winter. It is not advisable to defer the repairs to or the replacement of heaters until a later period, if adequate protection against winter weather is to be secured. Following the fall installations, both production and employment decline, because though heating apparatus may need replacement, it is difficult to do without heat during the period of installation, and hence the old equipment is repaired to last until mild weather.

The minor spring peak of activity results from two causes: first, it is frequently a matter of habit to have the heating apparatus overhauled and repaired or replaced in the spring; second, there is a demand for furnaces and other heating

[6] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 466.

apparatus to be installed in new buildings which are in the process of construction.

In view of the statement by the Federal Reserve Board that this industry displays a progressively changing seasonal character, it is interesting to compare the Federal Reserve Board indices for 1929 with those derived from the Census data based on the years 1904 to 1925. The two curves show almost complete agreement throughout the year. The Census data give no evidence of any progressive change, and the question may again be raised as to whether the change noted by the Federal Reserve Board is really a change in the character of the seasonal movement or results from the progressive change in their sample.

Steam Fittings

> This group comprises three industries whose primary products are, respectively, (1) steam fittings and steam and hot-water heating apparatus; (2) gas and oil stoves and appliances; and (3) stoves (other than gas, oil, or electric) and warm-air furnaces. The products of the first industry are steam and hot-water heating boilers, radiators, safety valves, vacuum gauges, heat regulators, coils, unions, flanges, and similar fittings, and other classes of steam specialties. Those of the second are stoves, ranges, heaters, and burners designed to consume gas, oil, alcohol, acetylene, and gasoline; flatirons heated with alcohol or other fuel burned internally; gas and oil appliances for heating water for kitchen or household use, and other gas-burning heating and cooking appliances. The products of the third are cast-iron, sheet-iron, and wrought-steel stoves and ranges, warm-air furnaces, auxiliary and ventilating heaters, and stove and furnace parts. . . .[7]

The seasonal curve of employment in the manufacture of steam fittings (Chart XVII) shows a response to variations in temperature. As was the case in seasonal indices for the manufacture of stoves, the peak of activity occurs in October and November, succeeded by a decline until January. There is a mild revival in February and March followed by a period of low activity until September. In general, the seasonal causes here are the same as those discussed under the manufacture of stoves.

[7] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 466.

The curve derived from the Federal Reserve indices, which are also shown in Chart XVII, shows a rough agreement with the Census curve, and the differences can probably be accounted for by the sample used.

Cutlery

The principal products of this industry are:

> Table and kitchen cutlery, pocket knives, putty knives, butchers' cutlery, razors (both plain and safety), scissors, pruning shears, clippers, axes, hatchets, chisels, cutting dies, etc.[8]

The seasonal pattern of employment shown in Chart XV is well defined but as in the case of several other Census classifications the products are of such a heterogeneous nature that an explanation of the causes is uncertain.

Employment is characterized by two maxima of about equal magnitude in March and November, a low point in July, and a secondary minimum in January. It is probable that the two peaks noted arise from the demand for certain of the products. Pruning shears, axes, and hatchets find considerable use in agriculture, which may account for the spring demand. The fall peak may be an anticipation of the Christmas demand for table cutlery.

Hardware

This industry includes the manufacture of:

> Motor-vehicle, coach, carriage, and railway hardware; builders' hardware; furniture, trunk, and suitcase hardware; marine hardware; plumbers' hardware; saddlery hardware; shoe hardware; stationery findings, etc. The manufacture of these lines embraces a large number of specific articles. More or less overlapping occurs between this industry and such industries as "Cutlery (not including silver and plated cutlery) and edge tools," "Tools, not including edge tools, machine tools, files or saws," "Forgings, iron and steel, not made in steel works or rolling mills," and "Foundry and machine-shop products, not elsewhere classified," but the amount of such overlapping cannot be estimated.[9]

[8] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 493.
[9] *Op. cit.*, p. 496.

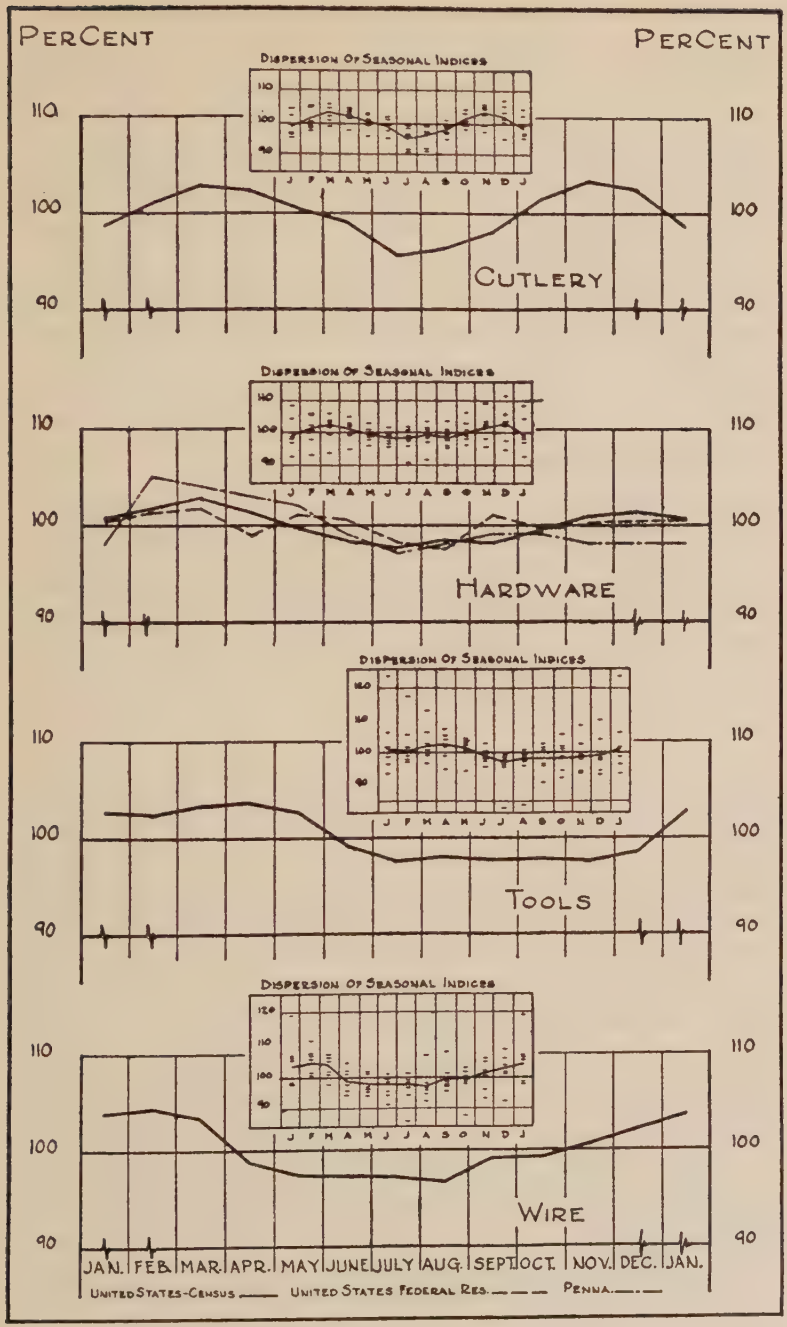

CHART XV. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF CUTLERY, HARDWARE, TOOLS, AND WIRE.

As in the case of cutlery, the products included under the classification of hardware are so diverse that a determination of the causes of the seasonal variations in employment can scarcely be hoped for. The curve presented in Chart XV represents the complex resultant of the seasonals in the various types of hardware manufacture and is presented without comment.

The general form of the seasonal pattern shows two periods of maximum activity in March and December with a period of low employment from May until October and a secondary minimum in January.

Tools

The principal products of this industry are:

> Plumbers' and tinners' tools, stonecutters' tools, drills (for both hand and power drilling appliances), reamers, wrenches, punches, pliers, calking tools, nail pullers, and other mechanics' hand tools except edge tools, files, and saws; other hand tools and implements such as shovels, scoops, hoes, rakes, forks, etc. Some overlapping occurs between this industry and "Cutlery (not including silver and plated cutlery) and edge tools," "Forgings, iron and steel, not made in steel works or rolling mills," and "Foundry and machine-shop products, not elsewhere classified."[10]

The dispersion chart of the monthly percentages of employment indicates some irregularities in the seasonal movements but on the whole the pattern of the seasonal movement is well defined. It consists of a maximum in April, succeeded by a moderately rapid decline until July. With practically negligible fluctuations, employment remains at the July level until December, when it again swings upward, and continues to rise until the April peak.

The miscellaneous character of the products in this group again makes the determination of the seasonal causes uncertain. To the extent that the products of the tool industry are used on farms, the spring activity may be attributed to the same causes as affect the demand for agricultural implements.

[10] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 502.

Wire

The wire industry, as defined for Census purposes, consists in the drawing of wire from purchased bars or rods of iron, steel, copper, or other metals, and does not, therefore, include production by the wire-drawing departments of iron, steel, copper, and other rolling mills. It does not include the manufacture of aluminum wire by establishments engaged primarily in the manufacture of aluminum products. . . . Some of the establishments in this industry manufacture various fabricated-wire products of the same classes as those made by establishments in other industries.[11]

The seasonal pattern of employment in the manufacture of wire shows February as the month of maximum employment. A decline then follows until August, after which employment increases steadily until the following February.

The products of this industry include iron and steel wire, copper wire, brass wire, nails and spikes, staples, barbed wire, cable, woven-wire fence and poultry netting, insulated copper wire, etc. Obviously with such a diversity of products, the seasonal movement is the resultant of a variety of demands.

Wirework

This classification embraces establishments engaged in the manufacture, from purchased wire, of woven-wire fencing, nails, wire cloth and netting, wire rope and cable, barbed wire, wire baskets, kitchen wire goods, wire springs, and other fabricated-wire products. It does not include data for plants manufacturing insulated wire, which is treated, for census purposes, as a product of the "Electric machinery, apparatus, and supplies" industry.[12]

Employment in the wirework industry (see Chart XVIII) is at its maximum in April and then declines to a low point in July. From August until October, employment increases, and then it declines until January.

The *Census of Manufactures* does not report separately the products of this industry and therefore the causes of the seasonal movement cannot be accurately determined. It

[11] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 479.
[12] *Op. Cit.*, p. 489.

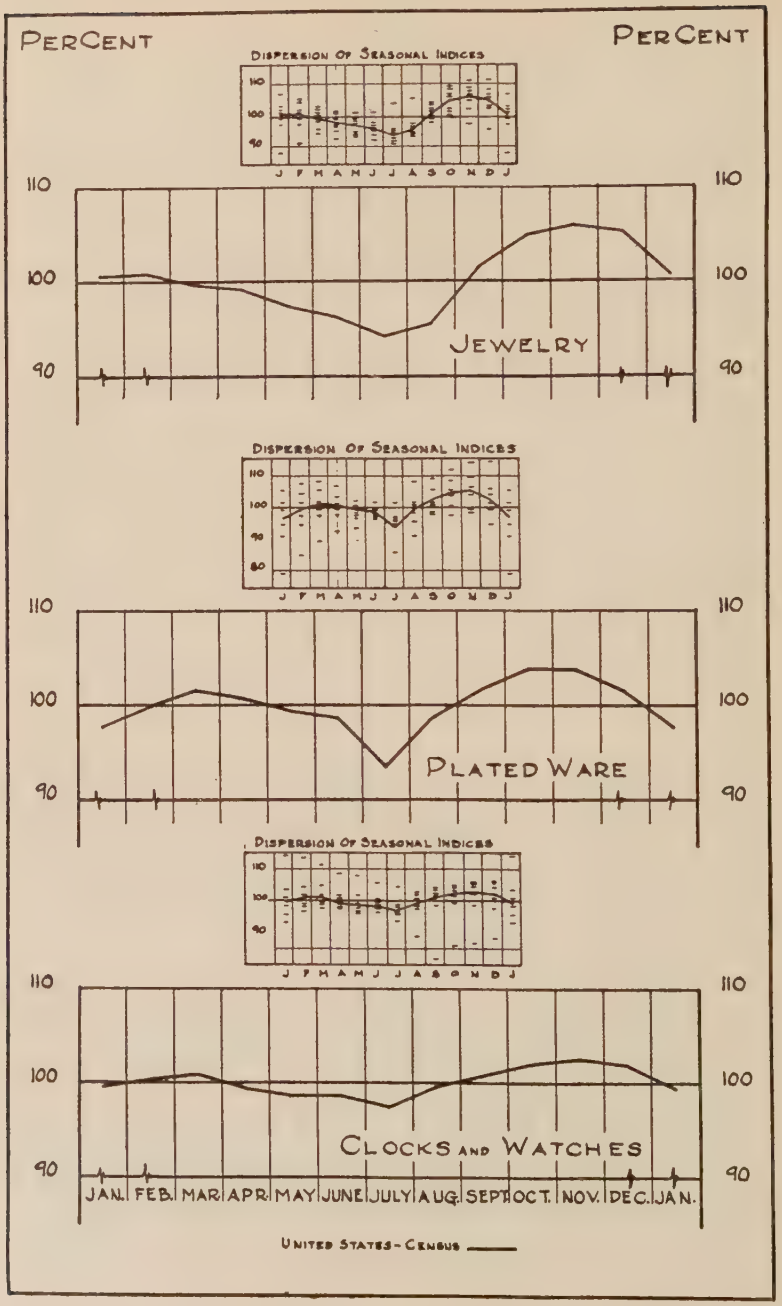

CHART XVI. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF JEWELRY, PLATED WARE, AND CLOCKS AND WATCHES.

is probable, however, that the seasonal forces operating here are the same as those present in the manufacture of wire.

Jewelry

Principal products:

> Articles, chiefly for personal adornment, made from gold, silver, platinum, gold-filled metal, rolled-gold plate, bronze, brass, copper, or other metals, plain, engraved, or chased, and with or without precious or semi-precious stones.[13]

The seasonal variations in employment in the manufacture of jewelry are traceable to habits of buying that have been almost institutionalized. The exchange of gifts at the Christmas season creates a demand for articles of jewelry which is neither equalled nor approached during any other period of the year. Thus it is not surprising to find the maximum employment in the jewelry trades occurring in November, when the industry is preparing to meet the Christmas demand. Following the satisfaction of the holiday trade, there is a sharp decline in employment, although the number employed does not drop below the average for the year until March. This maintenance of a more-than-average working force for three months after the peak is due to the length of the social season, for while the maximum demand for jewelry is for Christmas giving, there is a more or less persistent demand for articles of personal adornment throughout the winter period of social activities. In the spring, with a cessation of "indoor" events, attention is diverted to "outdoor" activities, and the wearing of jewelry is out of place. From February until July there is a steady decline in employment in the jewelry trades, but in August the working force again expands, and it continues to grow until the November maximum.

Clocks, Watches, and Parts

> This report covers four industries, whose primary products are, respectively, (1) clocks, clock movements, and time-recording de-

[13] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 975.

vices; (2) watches and watch movements; (3) watchcases; (4) clock and watch materials and parts, except watchcases.[14]

Like jewelry and plated ware, watches and clocks are articles commonly exchanged as gifts, and thus Chart XVI shows the period of maximum employment in the manufacture of timepieces occurring in the month of November, when the industry is preparing to care for the needs of the Christmas trade. This expansion is followed by a decrease in employment until January, when there is a slight revival which reaches a secondary maximum in March, probably in anticipation of the demand for clocks and watches as gifts to the newly married and to high school and college graduates. Succeeding this slight spring activity, there is a gradual decline until July.

Plated Ware

Principal products:

Flat and hollow tableware, toilet articles, fancy articles, etc., plated with gold, silver, or other metals.[15]

As in the manufacture of jewelry, seasonal variations in the manufacture of plated ware result, in large measure, from a demand regulated by buying habits and customs. The peak of productive activity and employment (see Chart XVI) occurs in October and November in preparation for the holiday trade and this is followed by a steady decline until January. A secondary maximum of employment is reached in March, when the trade is preparing for a spring demand for articles of plated ware for wedding and graduation gifts. The low points of activity are in January and July and mark the intervals between the two demands.

Smelting and Refining

Establishments engaged in the smelting and refining of nonferrous metals are classified for census purposes under four industry designations, as follows: (1) Copper; (2) lead; (3) zinc; and (4) other nonferrous metals—tungsten, nickel, and tin. (No establishment

[14] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 936.
[15] *Op. Cit.*, p. 977.

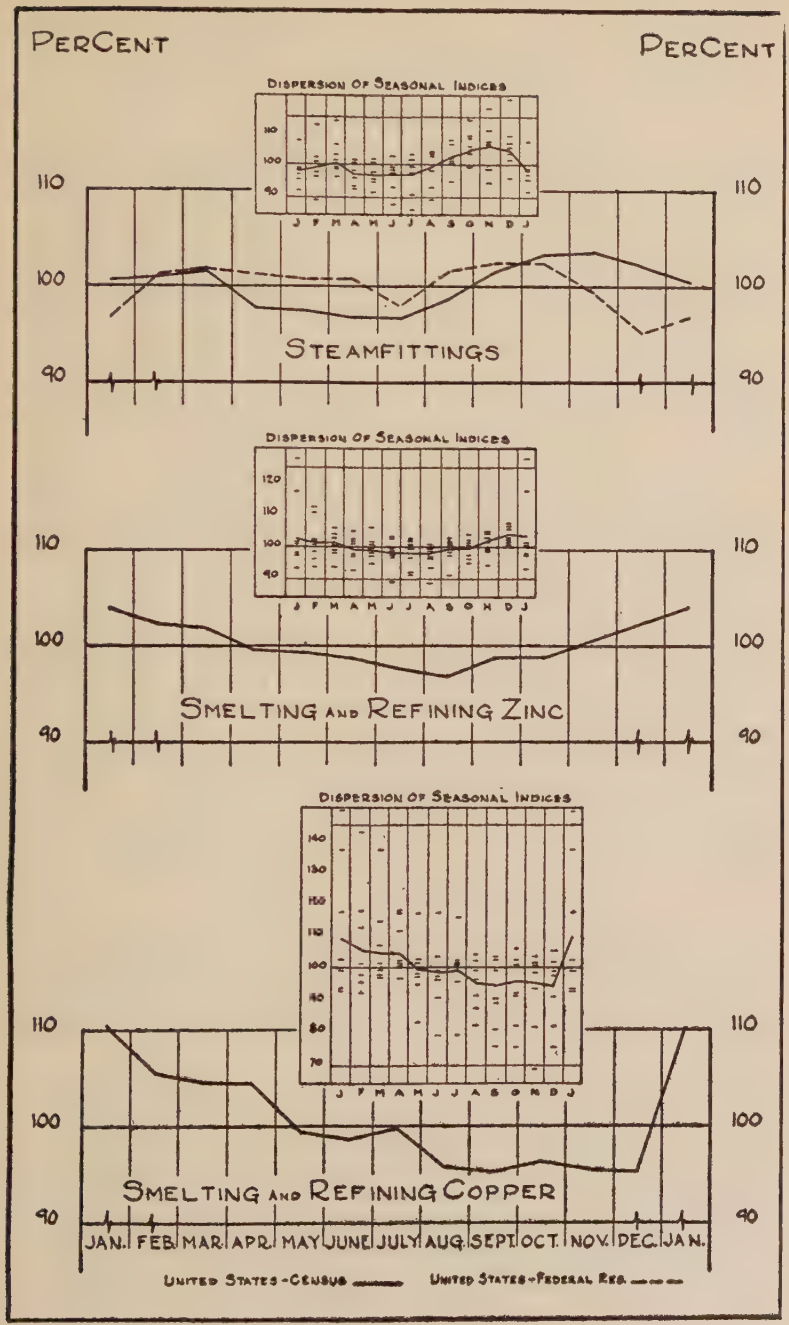

CHART XVII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF STEAM FITTINGS, THE SMELTING AND REFINING OF COPPER, AND THE SMELTING AND REFINING OF ZINC.

> classifiable in the last-named industry were reported at the census for 1925.) The copper smelters and refineries include establishments which smelt or refine copper ore or matte on toll, as well as those smelting ores of their own production. . . .[16]

Only two industries engaged in smelting and refining reported more than 10,000 wage earners in 1925, these two producing copper and zinc. Chart XVII shows a seasonal pattern for the smelting and refining of copper, but the wide dispersion of monthly relatives makes the accuracy of the amplitudes uncertain. However, in most years the employment data were large during the first half of the year and small during the second half, and the indices are presented because of this evidence of a seasonal tendency.

Seasonal indices of employment in the smelting and refining of zinc are also shown on Chart XVII. For this industry the pattern is well defined, showing the high point of employment in January, followed by a decrease until August, after which there is a rise to the January maximum. This pattern is caused by the seasonality in those industries using zinc, among the most important of which are the electrical, chemical, and wire industries. All of these are characterized by low activity in summer and high activity in winter, and these fluctuations are clearly reflected in the seasonal pattern for zinc.

Typewriters and Supplies

> This industry consists in the manufacture and rebuilding of typewriters and the manufacture of typewriter parts, accessories, and supplies. Typewriter accessories and supplies include carbon paper, ribbons, ribbon ink, ribbon spools, adding attachments, rubber keys, tools, etc.[17]

The seasonal pattern of employment for this industry as shown in Chart XVIII reflects the seasonal demand for office equipment in general. In most offices, the lull in activity comes during the summer months, during the vacation

[16] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 963.
[17] *Op. Cit.*, p. 1059.

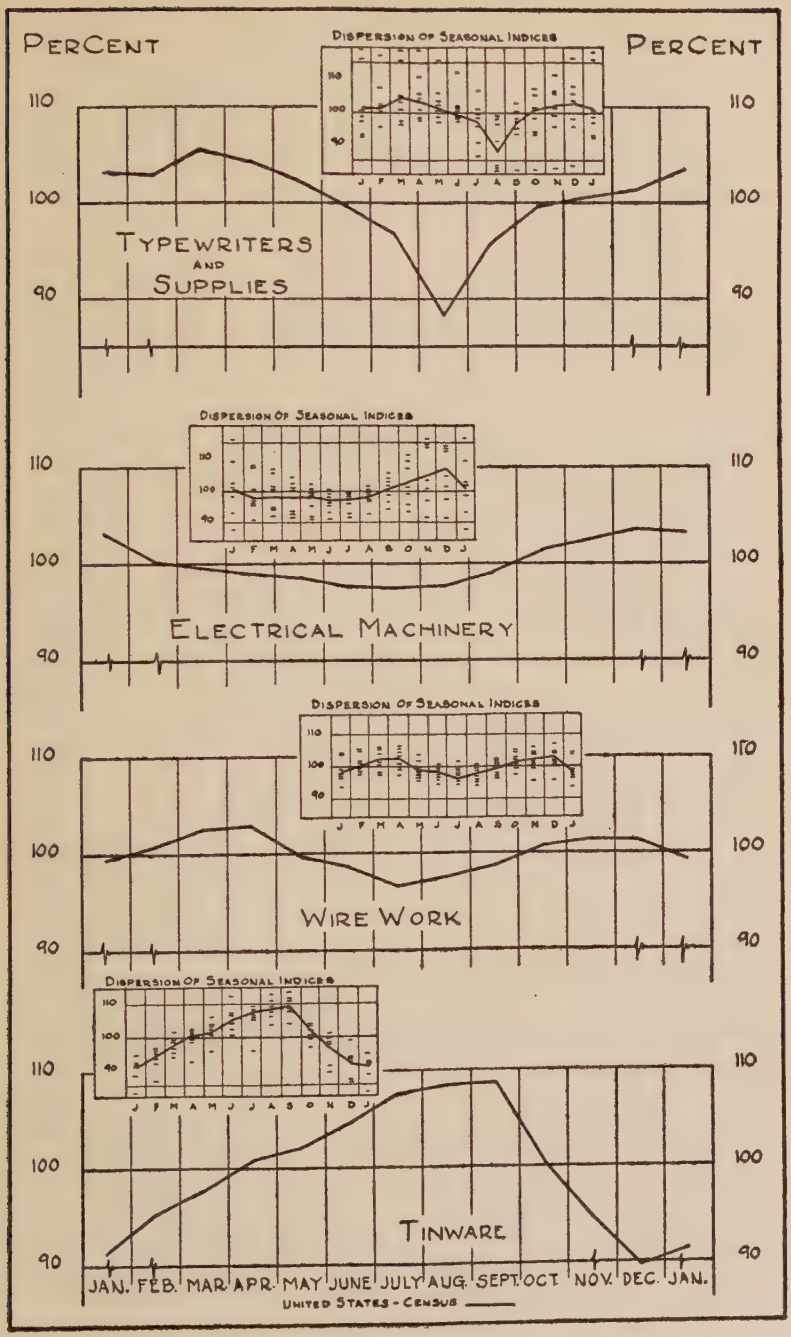

CHART XVIII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF TYPEWRITERS AND SUPPLIES, ELECTRICAL MACHINERY, WIREWORK, AND TINWARE.

period, and replacements or purchases of new equipment are most frequently made during the fall, winter, and spring. Maximum employment in the manufacture of typewriters and supplies occurs in March, followed by a fairly rapid decline until August, when the working force increases and continues a steady expansion until the March peak is again reached.

Electrical Machinery, Apparatus, and Supplies

> This industry embraces establishments engaged primarily in the manufacture of machinery, apparatus, and supplies for employment directly in the generation, storage, transmission, or utilization of electric energy. It does not include the manufacture of electric-lighting fixtures, electric signs, nor motor-driven tools, washing machines, adding machines, and other machines constructed with built-in motors, these products being classified for census purposes in other industries.[18]

Employment in the manufacture of electrical equipment including incandescent bulbs shows a seasonal pattern of mild amplitude with the maximum occurring in December and the minimum in July. The Census classification embraces such a heterogeneous collection of products that the causes for the seasonal pattern are somewhat obscure. A partial explanation is to be found in the seasonal demand for electricity. For household purposes of heating and lighting the winter consumption of electric current is much greater than that of other seasons. Likewise, in manufacturing establishments, the shorter days of winter necessitate the use of artificial illumination. This seasonal demand is probably transmitted to the manufacturers of electrical machinery. In support of this explanation, it is interesting to note that the peak of employment occurs in December, when the hours of daylight are fewest, and the low point, in June and July, when the days are longest. Further, employment swings from a condition "below average" to a condition "above average" immediately after the autumn equinox, and drops below average again immediately after the spring equinox.

[18] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1001.

Gas and Electric Fixtures

Principal products:

Brackets, chandeliers, electroliers, sconces, burners, domes, mantles, etc. (Complete lamps with their standards, such as floor, boudoir, and bridge lamps, are classified under "Lamps and reflectors, not including electric bulbs.")[19]

The demand for gas and electric fixtures is one which is derived in large measure from their use in the construction of new buildings. The maximum activity in building construction comes in August and September. Wiring and the installation of gas and electric fixtures is ordinarily one of the last phases of the work to be undertaken, and in the case of dwelling houses it is not uncommon to delay the selection of the fixtures to be used until the dwelling has been sold or rented, as the choice of the fixtures is often left to the purchaser or tenant. The fall demand is further stimulated by the need for artificial illumination during the period when the hours of daylight are shortest. Hence we find the peak of maximum employment in November followed by a rapid decline until January and a generally low level maintained until the fall revival in September.

Lamps and Reflectors

Principal products:

Lamps for motor vehicles; marine lamps; desk, table, bridge, and boudoir lamps; miners' lamps; lanterns, reflectors for show cases, stage lighting, etc. (Manufacturers of incandescent electric bulbs are classified in the "Electrical machinery, apparatus, and supplies" industry.)[20]

The demand for lamps and reflectors is the result of several factors which make for seasonality in production. The fall peak in employment is accounted for in some measure by the preparation for the Christmas trade and also in part by the decrease in the hours of daylight, which increases the need for artificial illumination. The pre-Christmas expan-

[19] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 974.
[20] *Op. Cit.*, p. 976.

sion is succeeded by a rapid decrease in employment until January, followed by an upswing to a spring maximum in March, anticipating a demand for lamps to be used in new dwellings, to be given as wedding presents, or to serve as replacements in apartments and dwellings which are being renovated for new tenants. In May, the volume of employment drops below average and continues below until September, when the fall revival of activity begins.

Tinware

The principal products of this industry are:

> Tin cans, pails, boxes, and household and cooking utensils. This industry does not include the manufacture of tin cans, pails, boxes, etc., for use as containers of products made by the same establishments.[21]

Employment in the manufacture of tinware rises to its maximum in September and then declines rapidly to a low point in December, reflecting the seasonal demand for tin cans in the canning of fruits, vegetables, fish, oysters, etc. Comparison with Charts II and III shows the general agreement of the peaks and troughs of the seasonal curves for tinware and canning. (Chart XVIII.)

The lesser intensity of employment fluctuations in the tinware industry results from two causes. First, the manufacture of a diversity of products other than tin cans tends to create stability. Second, many canning establishments manufacture their own containers and employees engaged in such work are not classified in the tinware industry.

Stamped and Enameled Ware, Not Elsewhere Classified

> The stamping of articles from sheet steel, tin, copper, and zinc, and, in many cases, the enameling of these articles. (Manufacturers of similar articles from aluminum are classified under "Aluminum manufacturers.") Principal products: Kitchen utensils, household and hospital ware, perforated screens for milling and mining, motor-vehicle license plates, metal seals, bottle and can caps and stoppers, buckles, suspender and garter trimming, etc.[22]

[21] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 502.
[22] *Op. Cit.*, p. 978.

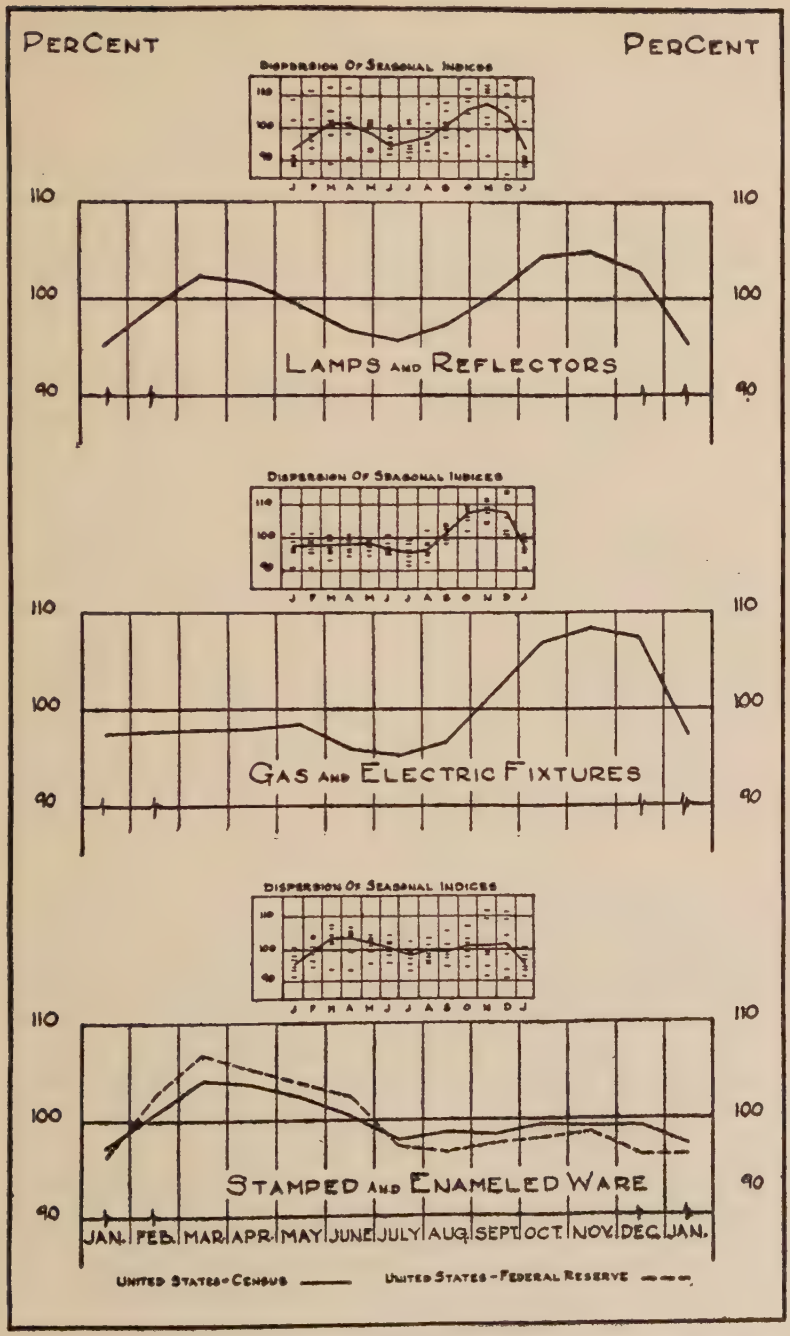

CHART XIX. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF LAMPS AND REFECTORS, GAS AND ELECTRIC FIXTURES, AND STAMPED AND ENAMELED WARE.

The seasonal pattern for stamped and enameled ware as shown in Chart XIX is rather well defined but because of the miscellaneous classification, it becomes difficult to ascertain the reason for the seasonal peak of employment in March, the rapid decline which follows, and the continued small volume of employment until the following January. It is quite probable, however, that a portion of the spring activity may be accounted for as resulting from the replacement of articles of household equipment during the period of spring cleaning.

A comparison of the indices derived from the Census data with those reported by the Federal Reserve Board shows a complete agreement as to the form of the seasonal pattern although the amplitude of the fluctuations is somewhat greater in the case of the Federal Reserve figures, which have a range of 10.5 per cent as contrasted with a range of 7.0 per cent shown by the Census indices. The average deviations of the two are 3.4 and 1.8 per cent respectively. This difference, which is probably due to the difference in the time periods covered by the two sets of data and the character of the sample used by the Federal Reserve Board, is in accord with the general differences which have been noted in other industries.

Ship and Boat Building

The statistics for this industry cover privately owned establishments engaged primarily in the construction or repair of water craft of any kind. Since 1919 no data have been collected from shipyards operated by the Federal Government, and no statistics relating to such shipyards are shown in this report. For census purposes the industry is divided into two branches: (1) Steel shipbuilding, including repair work; (2) wooden ship and boat building, including repair work. Each establishment as a whole is classified in one branch or the other, according to whether it was engaged wholly or chiefly in steel shipbuilding or in wooden ship or boat building.[23]

Chart XX shows the indices of employment in the two branches of the shipbuilding trades. Unlike any other in-

[23] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1132.

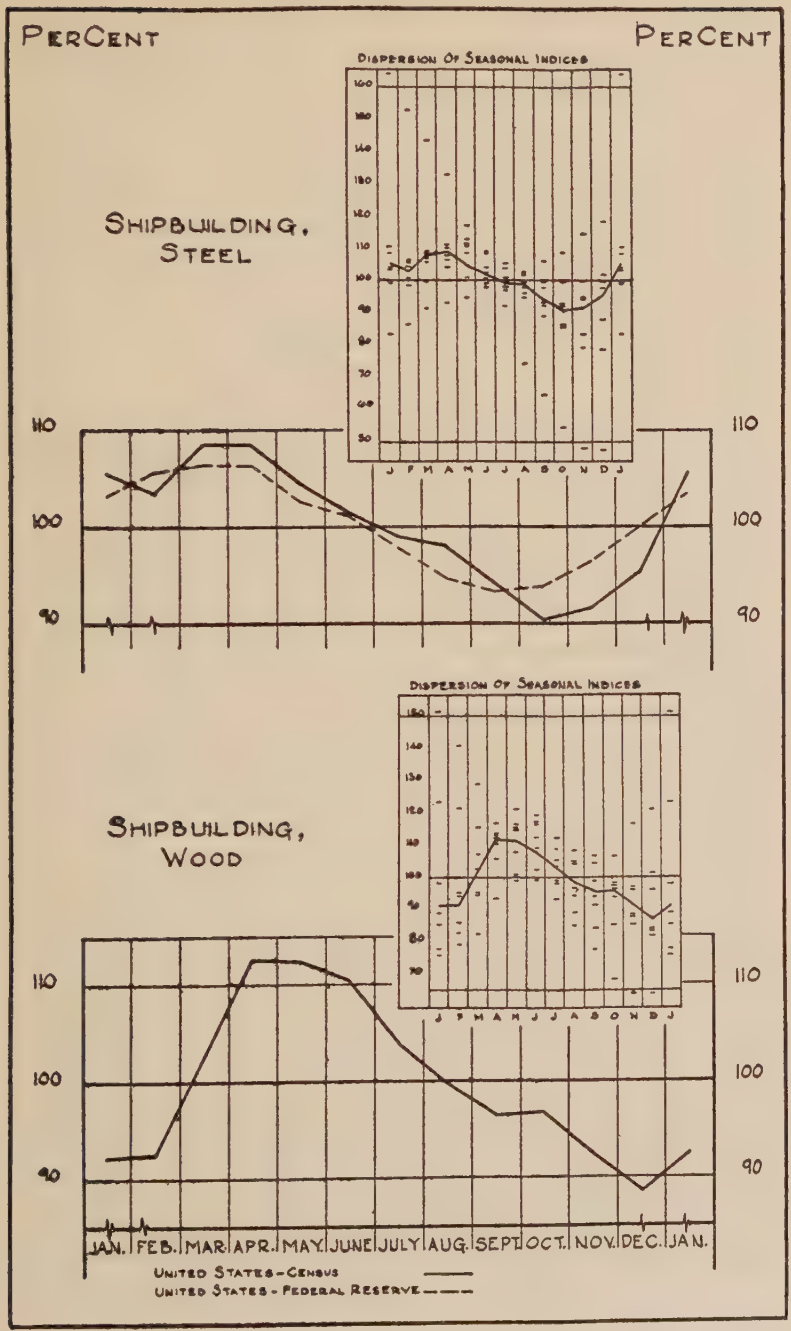
PERCENT
PERCENT
SHIPBUILDING, STEEL
DISPERSION OF SEASONAL INDICES
J F M A M J J A S O N D J
110
100
90
SHIPBUILDING, WOOD
DISPERSION OF SEASONAL INDICES
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN.
UNITED STATES - CENSUS
UNITED STATES - FEDERAL RESERVE

CHART XX. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE SHIPBUILDING INDUSTRIES.

dustry in this survey, shipbuilding presents data on employment for the year 1916 as well as the seven Census years which have formed the basis of the other seasonal calculations. An examination of the dispersion chart for the monthly percentages shows a wide range of values, in spite of which the form of the seasonal curve is well defined. The extreme or abnormal cases occurred during the years in which the shipbuilding trade was disturbed by the influence of the World War. Hence in determining the typical seasonal, the two largest and two smallest values were discarded and the remaining four were averaged.

The pattern of the two seasonals, which in general are quite similar, is easily explained by the length of the period of production and the seasonal use of the product. Unlike most industries, shipbuilding has little manufacturing to stock. Practically all of the building is done to special order except in the case of the smaller pleasure craft. The maximum use of boats occurs during the summer months and if the prospective purchaser plans to use his vessel during a particular summer, he must place his contract for building during the preceding winter. In the case of very large craft, relatively few of which are built in the United States, the period of construction may take several years, but for small vessels, for example small pleasure boats, a contract placed in the fall or winter will be completed by the following summer. Thus the peak of employment in the fabrication of steel ships occurs in March or April, and is followed by a rapid decline until October; in the building of wooden boats the peak of employment is in April and May, and is succeeded by a sharp decrease until December. These differences can be explained by the relative lengths of the building periods. Steel vessels require a longer production schedule and hence orders for ships to be used the following summer are placed in October and November, which explains the increase in employment in the fall of the year. After the middle of winter, orders for vessels cannot be filled for the coming summer season; hence few are placed

TABLE 6

RANGES AND AVERAGE DEVIATIONS OF THE SEASONAL INDICES IN THE IRON AND STEEL, MACHINERY, TRANSPORTATION EQUIPMENT, AND NON-FERROUS METALS INDUSTRIES

Industry	Census		Federal Reserve Board		Pennsylvania		Ohio	
	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.
IRON AND STEEL PRODUCTS								
Cutlery	7.7	2.2	...	...	...	...	...	...
Hardware	4.7	1.4	4.2	1.0	7.0	2.3	...	...
Steam Fittings	7.0	2.1	7.2	1.8	...	...	...	...
Stoves	21.9	4.3	20.6	3.8	20.0	3.0	13.3	2.9
Tin	18.8	5.2	...	...	...	...	...	...
Tools	6.0	2.4	...	...	...	...	...	...
Wire	7.6	2.3	...	...	...	...	...	...
Wirework	5.9	1.6	...	...	...	...	...	...
MACHINERY								
Agricultural Implements	25.9	7.7	14.6	4.4	...	...	14.9	4.2
Engines and Water Wheels	13.3	4.8	...	...	...	...	...	...
Pumps and Pumping Equipment	7.5	2.0	...	...	...	...	...	...
Typewriters and Supplies	17.4	3.3	...	...	...	...	...	...
Electrical Machinery	6.3	1.7	...	...	40.0	12.8	...	...
TRANSPORTATION EQUIPMENT								
Motor Vehicles	17.4	4.3	21.5	4.8	19.0	6.2	18.4	4.0
Motor-vehicle Bodies and Parts	18.1	3.3	...	...	...	...	...	...
Shipbuilding, Steel	18.2	5.4	13.0	4.1	...	...	...	...
Shipbuilding, Wooden	24.3	6.9	...	...	...	...	...	...
METALS AND METAL PRODUCTS								
Gas and Electric Fixtures	13.2	4.0	...	...	...	...	...	...
Jewelry	11.8	3.2	...	...	...	...	...	...
Lamps and Reflectors	11.0	2.9	...	...	...	...	...	...
Plated Ware	10.6	2.1	...	...	...	...	...	...
Smelting and Refining, Copper	15.2	4.1	...	...	...	...	...	...
Smelting and Refining, Zinc	7.1	1.7	...	...	...	...	...	...
Stamped and Enameled Ware	7.0	1.8	10.5	3.4	...	...	...	...
Watches, Clocks, and Parts	5.0	1.2	...	...	...	...	...	...

and as the fall contracts are completed, the workmen are laid off. In the building of wooden craft, where the production period is shorter, orders may be placed later in the year, so that the expansion of employment does not occur until January. The period of decline from the spring peak is much longer, on account of orders that are placed late.

The Federal Reserve indices which are plotted on the same chart are not strictly comparable with the steel shipbuilding indices since they are based on the building of both steel and wooden ships. Their pattern, however, agrees fairly well with the steel shipbuilding curve, indicating that the Federal Reserve sample includes a large proportion of steel shipbuilding concerns.

The severity of the seasonal influence is somewhat greater in the fabrication of wooden vessels, the seasonal range being 24.3 per cent as contrasted with a range of 18.2 per cent in the making of steel ships, a difference which probably results from the stabilizing effect of contracts for the larger vessels in the steel shipbuilding trade.

Summary

The outstanding characteristic of the investigation of the industries which have been discussed in the preceding sections has been the difficulty of determining the causes of the seasonal variations. This was particularly great in the case of the industries engaged in the manufacture of iron and steel products. Here, perhaps more than anywhere else, the Census groupings of industries serve to obscure the nature of the employment fluctuations and to make the explanation of seasonality uncertain. When industries satisfying a diversity of demands are grouped as a single industry, the identity of the seasonal forces which affect those demands is lost. Hence, unless climate or custom exert a limiting effect upon the actual process of production, which is not the case in the iron and steel industries, the effort to ascertain the underlying reasons for the seasonal movements produces results which are only partially satisfactory.

Despite the difficulty of determining seasonal causes, however, certain general conclusions may be drawn. Those industries which are affected by climate in the demand for their products are subject to the most extreme variations. Thus industries manufacturing "agricultural equipment," "stoves," "engines and water wheels," "ships," and "motor vehicles" are characterized by the largest ranges of variation, while the industries which are affected by a custom-regulated demand show milder seasonal movements.

A comparison of the ranges of variation displayed by the Census indices with the ranges of the indices of the Federal Reserve Board, and the Pennsylvania and Ohio indices, does not show the uniform relationship which was noted in the

textile industries. In some cases the Census indices have smaller ranges and in some cases larger, but in most of the instances where the Census data fluctuate more, the Federal Reserve Board has designated the industry as one of changing seasonal characteristics. Since the Federal Reserve curves are for the year 1929, the difference in the time intervals on which the two sets of indices are based may account for the unexpected differences.

CHAPTER V

THE STONE, CLAY, AND GLASS, AND LUMBER PRODUCTS INDUSTRIES

The industries to be discussed in this chapter comprise two of the Census classifications, the manufacture of "Stone, clay, and glass products" and the manufacture of "Lumber and timber products." The first of these groups includes those industries whose products are primarily the raw materials of the construction industry and to these has been added the manufacture of "Structural and ornamental ironwork not made in rolling mills," which is usually classified under iron and steel products.

Lumber and timber products are also in constant use in the construction industries and hence certain divisions of the lumber industry, particularly planing mills, show a seasonal movement which is a direct reflection of the seasonal activity in building. Others of the wood products, however, show seasonal movements which result from different causes.

The Stone, Clay, and Glass Products Industries

Included in this classification are twenty industries of which only eight reported more than ten thousand wage earners in 1925, but these eight employed 321,491 out of the total of 353,036 workers. Without exception, employment in these industries showed a well-defined seasonal pattern which could in part be traced to the seasonal activity in construction.

The construction industries have afforded perhaps the most conspicuous examples of seasonal operation, and the problem of seasonality has received considerable attention. In 1921, a committee was appointed by the President's conference on unemployment to make a careful survey of the

problem of seasonality in the construction industries. Some of their more important conclusions are presented in the following quotation from the summary of their report.

> Custom, not climate is mainly responsible for seasonal idleness in the construction industries. Contrary to popular belief, bad weather is not the principal cause of variations in employment from month to month. The present survey shows that seasonal idleness is not confined to regions where climate is severe. Cities in the South and on the Pacific Coast are affected much like those on the Canadian border.
>
> . . . . . .
>
> The effect of the burden of idleness falls most heavily not on the producers and distributors but on the employees and the public. Construction costs are high in part because of the seasonal hazard which affects each step of the construction process from felling timber, quarrying rock, manufacturing brick, cement, tile, plaster, and a hundred and one other commodities, transporting these materials by railway, waterway, and highway, distributing them through retail supply dealers, clearing of site and excavating, to the completion and furnishing of the finished building. Idle time represents waste and direct losses to the construction industries, the workers, and the public.
>
> The art of construction has advanced to such a point that the effect of bad weather on building operations has been greatly reduced. The survey shows that there is today much less manual labor on the job than formerly; a greater proportion of the work is done in factories by power machinery, which is less affected by the elements than hand labor. Steel and concrete construction, with certain safeguards, can go forward at low temperatures. Methods of winter construction developed by leading contractors should now be greatly extended.[1]

In the succeeding sections of this chapter, the indices of employment in the industries manufacturing the raw materials for the building trades will indicate the widespread effect of seasonal activity in construction.

Cement

This industry consists in the manufacture of hydraulic cement from rock usually quarried by the same establishments. The princi-

[1] *Seasonal Operation in the Construction Industries*, Report and Recommendations of a Committee of the President's Conference on Unemployment. New York, 1924, p. xi.

pal product is Portland cement, but small quantities of natural and puzzolan cements are also manufactured.[2]

Cement is one of the most important raw materials of the construction industries. Within the Census classification of "Stone, clay, and glass products," which includes the bulk of building materials exclusive of iron and steel, the manufacture of cement ranks second to the brick and tile industries in the value of product. Hence the seasonal pattern of employment in cement production reflects the variations in activity of the construction industries to a marked degree.

The spring revival in construction occurs in April; in August or September the activity rises to a peak, succeeded by a decline to a level of almost complete idleness during the months from December to March. The curve of employment in the manufacture of cement follows this pattern closely, showing some tendency to precede. The number of wage earners increases in March and continues to grow to a point of maximum employment in August, after which there is a steady decline until February.

Chart XXII shows the seasonal indices of employment derived from the Census data, together with the Federal Reserve indices and those computed by J. F. Dewhurst for Pennsylvania. The agreement of the first two is very close both in pattern and amplitude, but the Pennsylvania indices, while showing the same general outline, have a much smaller amplitude.

The Federal Reserve Board has found that the seasonal variations in the manufacture of cement show a progressive change; its curve shown in Chart XXII is based on values for the year 1929. The Census data substantiates this conclusion, indicating that, while the months of maximum and minimum activity have remained the same, the severity of the fluctuations has materially decreased. Thus in 1904 the month of maximum employment showed an index of 112.3 per cent of the average for the year and in 1925 the index for the maximum month was 106.0 per cent. Likewise the

[2] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 860.

TABLE 7

SEASONAL INDICES OF EMPLOYMENT IN THE STONE, CLAY, AND GLASS, AND LUMBER PRODUCTS INDUSTRIES, BASED ON U. S. CENSUS DATA, 1904–1925

Industry	Average Number Employed 1925	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range	Average Deviation
STONE, CLAY, AND GLASS PRODUCTS															
*Brick and Tile Products	102,777	88.0	88.7	92.7	99.7	105.4	108.2	108.7	107.2	105.1	101.2	100.2	94.9	20.7	6.0
*Cement	38,437	92.1	90.6	95.1	99.6	100.6	103.6	105.6	106.1	105.1	103.1	101.9	96.6	15.5	4.3
*Concrete Products	14,722	81.9	82.4	92.5	104.7	108.9	108.6	107.5	107.9	105.4	103.5	100.4	96.3	27.0	7.8
*Glass	69,371	100.7	97.5	101.2	101.4	101.4	98.4	96.8	97 3	99.3	103.9	102.3	99.8	7.1	1.8
Lime	12,095	85.8	87.7	95.9	104.1	105.4	104.7	104.4	108.2	108.1	105.1	99.5	91.1	22.4	6.7
Marble, Slate, and Stone Work	36,575	84.7	85.1	92.1	100.3	104.3	106.0	107.6	108.4	108.5	106.3	101.6	95.1	23.8	7.2
Paving Material	17,941	72.1	69.9	79.5	97.3	111.4	116.8	119.1	120.1	119.5	114.0	98.7	81.6	48.0	16.8
Pottery	36,536	93.4	95.5	98.4	99.2	99.3	99.4	98.3	101.8	103.1	104.1	104.0	103.5	10.7	2.8
Structural and Ornamental Iron-work	48,341	98.4	96.6	96.6	97.3	99.4	100.4	101.9	103.7	103.7	103.3	100.4	98.3	7.1	2.2
Wall Plaster	10,978	89.2	89.3	95.5	102.2	104.0	103.8	103.6	105.5	105.3	104.6	100.7	96.3	16.3	5.0
LUMBER AND ALLIED PRODUCTS															
Coffins, Caskets, and Morticians' Goods	13,296	100.8	102.1	102.6	101.6	100.3	99.4	96.8	97.6	98.7	99.6	100.2	100.3	5.8	1.3
Cooperage	11,483	97.6	98.2	99.9	99.4	98.4	100.3	97.0	100.2	103.4	105.4	101.6	98.6	8.4	1.8
Furniture	180,895	96.1	97.8	99.6	99.8	98.6	98.2	96.1	98.8	101.7	104.1	105.2	104.2	9.1	2.5
Lumber and Timber Products	473,998	96.2	97.8	99.9	99.7	101.2	101.2	98.6	100.2	100.8	102.4	102.6	99.4	6.4	1.4
Planing Mills	111,329	91.5	92.7	95.1	98.4	100.1	102.0	103.6	103.9	104.2	104.1	103.1	101.3	12.7	3.7
Turpentine a nd Rosin	29,413	94.8	95.5	97.5	102.5	103.4	103.5	103.5	102.4	101.6	100.6	98.8	95.9	8.7	2.9
Wooden Boxe s	34,834	96.9	98.0	100.2	101.8	102.2	102.2	100.6	99.6	100.0	100.6	99.9	98.0	5.3	1.3
Wood, Turned and Carved	10,352	101.5	103.3	104.7	102.2	99.8	98.0	95.8	95.8	96.8	98.9	100.9	102.3	8.9	2.5

* These industries were characterized by a changing seasonal and values given are those estimated for 1929. For seasonal values for Census years, see Appendix

month of minimum employment in 1904 had an index of 78.6 per cent while in 1925 the lowest index for any month was 91.0 per cent of average. These changes have been recognized in the determination of the Census indices presented in Chart XXII. The curve given there is for the year 1929 and hence is comparable with the curve of the Federal Reserve indices.

The seasonal values for 1929 were determined by the projection of a free-hand curve fitted to indices for each month. These projected values for each month were then centered on the average for the year.[3] While it is admitted that free-hand curve fitting and projection is subject to a large margin of error, a comparison with the Federal Reserve indices shows remarkably close agreement.

Three principal causes have contributed to the changes. First, improvements in the technique of building have made possible the use of cement in colder temperatures and have thus prolonged the period of building activity. Second, the specifications of cement are so completely standardized that manufacturing to stock is attended with a relatively small hazard of overstocking. Third, the manufacturers of cement by a carefully conducted campaign of education in the uses of cement at low temperatures and by extensive advertising have at least partly succeeded in bringing about the year-round use of cement.

Concrete Products

> This industry embraces establishments engaged primarily in the manufacture of concrete products, such as building blocks, pipe, floor and other tile, laundry trays, garden furniture, fence posts, etc., made of sand, gravel, or crushed rock bound together with cement.[4]

The manufacture of concrete products shows seasonal variations in employment which are in general conformity with the seasonal activities in the building trades. The period of minimum activity occurs in January and February; it is

[3] Estimated values for the Census years are given in the Appendix.

[4] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 886.

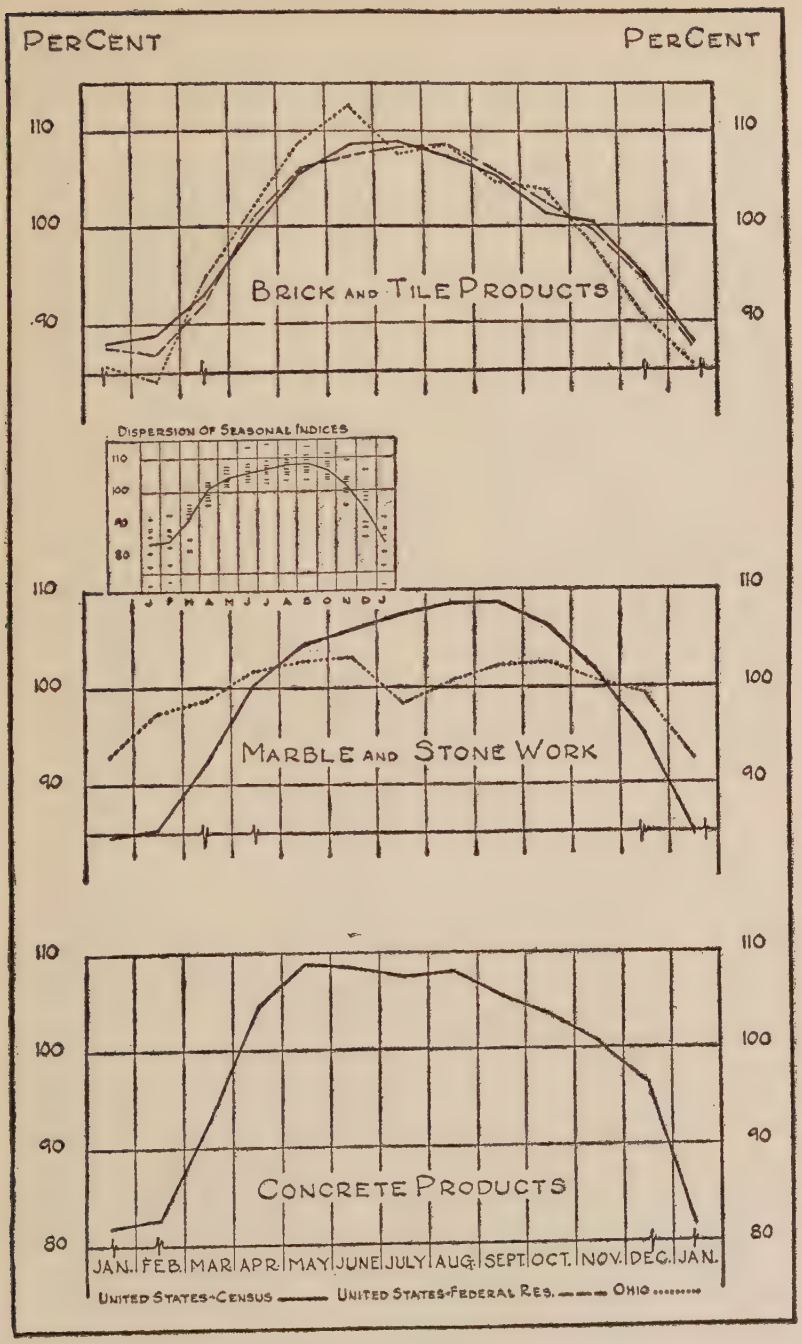

CHART XXI. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF BRICK AND TILE PRODUCTS, MARBLE, SLATE, AND STONE WORK, AND CONCRETE PRODUCTS.

succeeded by a rapid rise to a maximum in May. From May to August employment maintains about the same level, then declines gradually until December, and drops sharply in January.

The seasonal pattern just described was maintained consistently in the years covered by the Census data, but here as in the case of the brick and cement industries, there was a progressive diminution in the amplitude of the fluctuations. This change in the seasonal amplitudes in general followed an arithmetic progression, so that straight lines were fitted by the method of least squares to the percentage values for each month and these straight lines were projected to obtain the indices for the year 1929 which are shown in Chart XXI.

The causes of the declining seasonal amplitude are to be found in the improved technique in protecting concrete against freezing which has prolonged the period during which it may be handled. Further, it is possible, when the objects to be constructed are small, to manufacture and store them in the winter months in anticipation of the summer demand. In general, however, there is a lack of standardization of the products which causes advance production to be attended by the hazards of an uncertain demand.

Paving Materials

Principal products:

> (1) Paving blocks of asphalt, creosoted wood, bluestone, concrete, granite, and various compositions; (2) mixed paving materials, including artificial asphalt, asphalt mixture for top coat and binder; bituminous and other cements, liquid asphalt, and tar concrete; (3) unmixed materials, including crushed furnace slag, granite, sandstone, and limestone, distillate, pitch, tar, coal-tar, flux, screenings, macadam, riprap, and ballast.[5]

Climate combined with the habits of the public is largely responsible for the seasonal movements in road building. There is a popular belief that road construction can be carried on only during the summer months and that with the

[5] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1184.

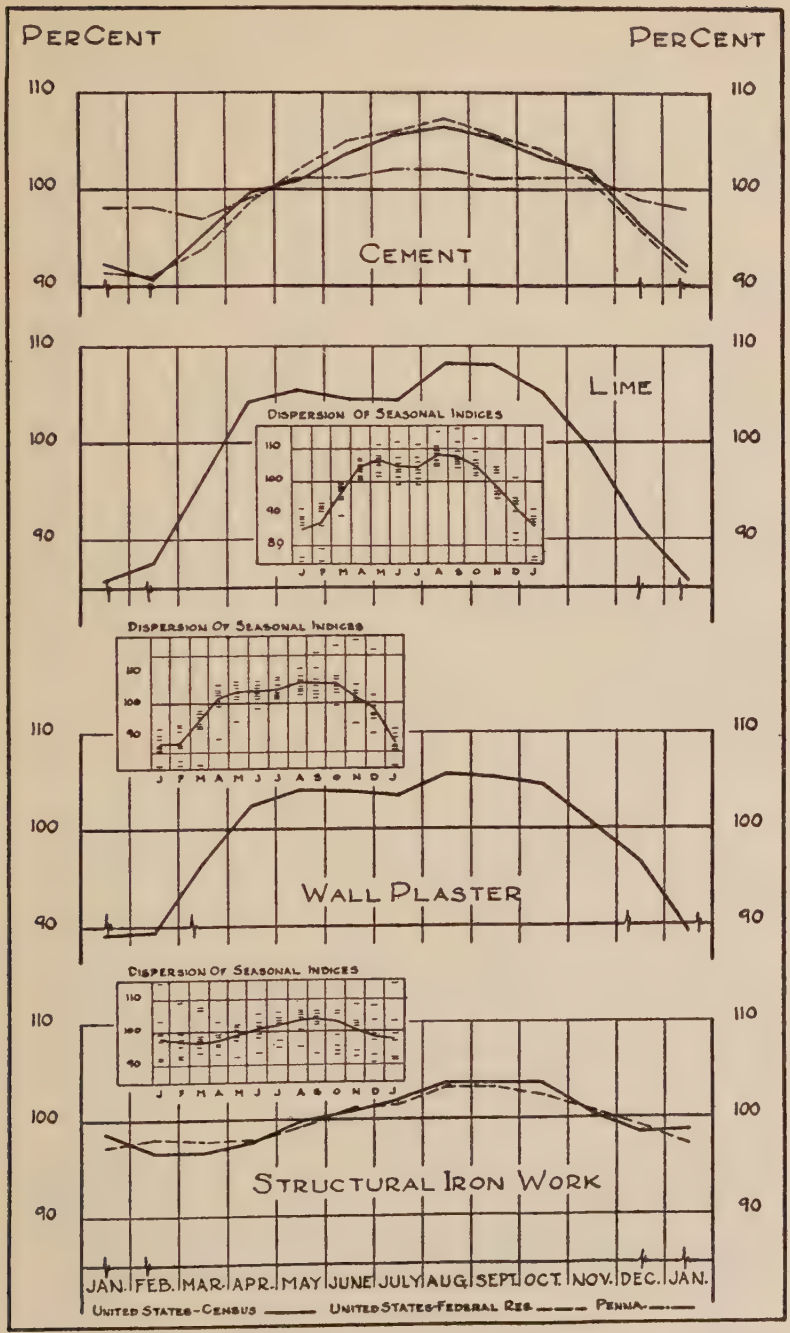

CHART XXII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF CEMENT, LIME, WALL PLASTER, AND STRUCTURAL AND ORNAMENTAL IRONWORK.

approach of cold weather such activity must cease. It is true that during cold weather the possibility of freezing is a greater hazard in the laying of concrete roads than in the construction of concrete buildings, but the period in which the hazard is a real one is much shorter than the period of inactivity in road building. In the case of other materials, there is more difficulty in the work during the winter months, but some work is possible except in extremely bad weather.

Road construction also is very largely dependent on the customs and habits of the highway departments. A survey by a committee of the unemployment conference showed that in the majority of cases contracts for road building were let at times which necessitated summer construction.

The seasonal pattern of employment in the manufacture of paving materials (Chart XXIII) reflects directly the effect of climate and custom, showing a minimum of employment in January and February followed by a very rapid expansion until July. During August and September employment remains at approximately the July level, and then falls off rapidly until December.

Brick and Tile Products

> This classification embraces all establishments engaged primarily in the manufacture of brick, draintile and other tile, sewer pipe, stove lining, terra-cotta products, and other refractories, both clay and nonclay.[6]

As in the case of cement, employment in the brick and the tile industries gives evidence of a changing seasonal amplitude, and hence the Census curve shown in Chart XXI is for the year 1929, the values being obtained by the same method as was used for the indices of employment in the cement industry. Again, the agreement with the curve of the Federal Reserve indices is close both in pattern and amplitude; both curves show a minimum of employment in January, then a steady upward swing to a maximum in May

[6] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 869.

and June, succeeded by a steady downward movement until January. The causes of these variations are traceable directly to the seasonal activity in building construction, and the fact that the peak of activity in brick manufacture occurs earlier than in cement is due to the greater use of brick in the first stages of construction.

Brick also shows a somewhat greater amplitude of fluctuation than cement, resulting from certain obstructions to the ironing out of the seasonal movements. First, brick manufacture is carried on by small enterprises, thus making a budgeting of production more difficult, whereas cement is produced in large-scale establishments. Second, cement is capable of a wider diversity of uses than brick, a fact which exerts a stabilizing effect upon the total demand. Third, manufacturing brick to stock is attended by the difficulty of securing adequate cheap storage space, for the value of the product is low in relation to its bulk. Fourth, the clay needed in brick manufacture is difficult both to obtain and to handle during extremely cold weather. Finally, brick is produced largely for local markets and the fluctuations in demand are so great that manufacturing to stock is attended with a real hazard of overstocking.

Brick manufacturers have recognized their problem and through publicity campaigns have emphasized the practicability of winter construction with brick, but progress in such an educational campaign is necessarily slow when it involves the changing of well-established habits. Standardizations of brick and tile sizes, which were adopted in 1923 and 1924, may also help to simplify the seasonal problem by making the manufacture to stock less uncertain than it was when sizes were numerous.

Pottery

This industry designation covers establishments engaged primarily in the manufacture of stoneware, earthenware, porcelain ware, vitreous china plumbing fixtures, and allied products.[7]

[7] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 881.

This classification covers such a heterogeneous group of products that the seasonal curve of employment for the industry is necessarily the resultant of the seasonals in the various divisions of the industry. Here, the explanation of causes must be confined to the more important divisions.

The curve of employment shown in Chart XXIII indicates January as the month of minimum employment; a gradual rise takes place throughout the spring months and then follows a slight decline in July. Employment increases from July to October are succeeded by mild decreases in November and December with a sharp drop in January.

The fall maximum probably results from the demand for plumbing supplies and fixtures in the completion of new buildings. As in the case of marble, glass, structural and ornamental ironwork, and wall plaster, the need for the product comes as newly erected structures near completion. The decline in July results from the same causes as those affecting the manufacture of lime and glass, namely, the heat necessary in production when combined with normal summer temperatures makes the conditions of employment almost unbearable and activity is necessarily retarded.

Lime

> This industry designation is applied to establishments engaged in the burning of lime, chiefly from limestone, but to a small extent from shell and other substances. The principal products are quicklime and hydrated (slaked) lime. The minor products include limestone sold as such, ground limestone, crushed stone, flux, etc.[8]

Lime is one of the principal constituents of wall plaster and also of the mortar used in brickwork, and hence it is not surprising to find that the employment curve follows the general pattern of employment in the other industries engaged in the manufacture of raw materials used in construction. (Chart XXII.)

Minimum employment occurs in January. February shows a slight increase followed by a rapid rise until April. From

[8] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 904.

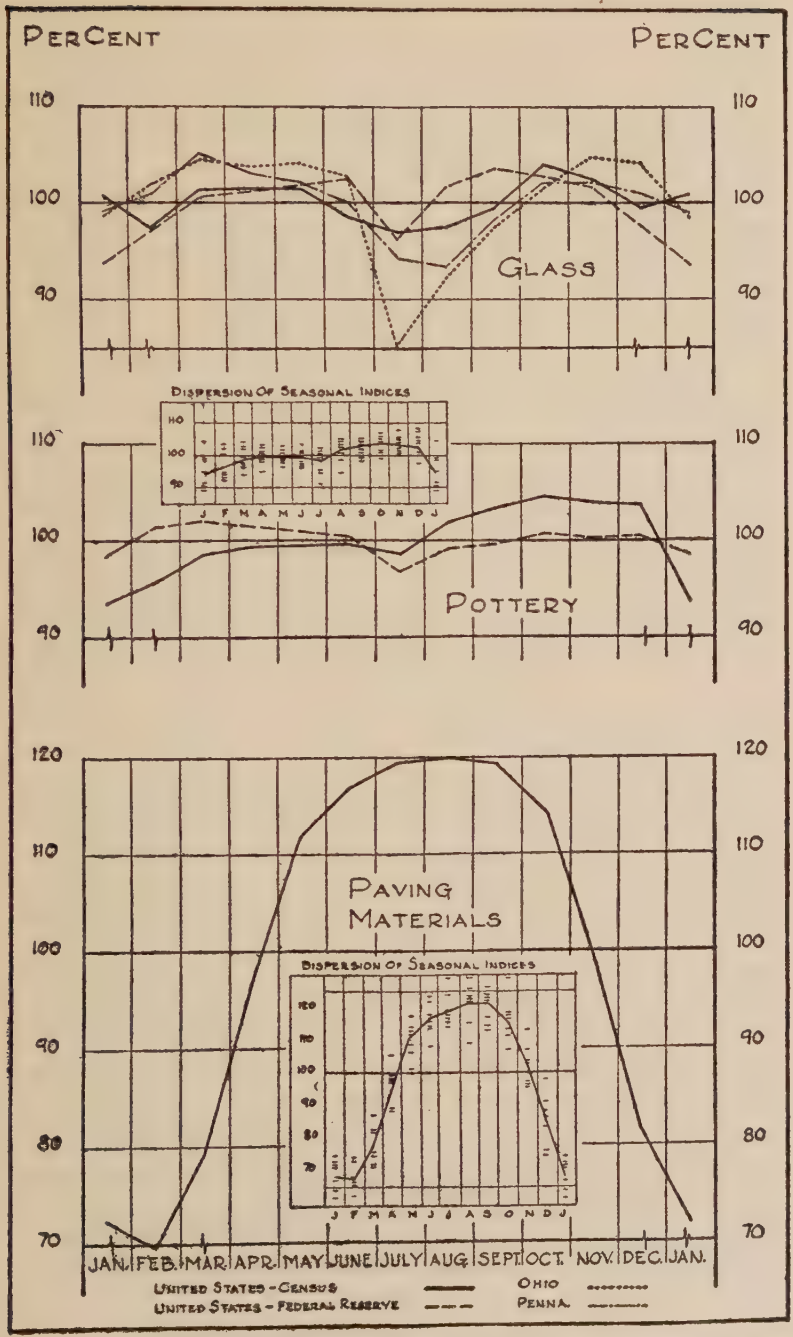

CHART XXIII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF GLASS, POTTERY, AND PAVING MATERIALS.

April until July the number of wage earners remains nearly constant. In August, however, employment increases appreciably and this level is maintained in September. Beginning with October, employment starts to decline, and continues downward until January.

The most outstanding feature of the employment curve in the manufacture of lime is the steady level maintained from April until July. This failure to increase during these months (there is actually a barely perceptible decline in July) is probably due to the same factors as cause the July drop in employment in the manufacture of glass. During the summer months, the heat required in the burning of lime becomes particularly oppressive and production must be curtailed. In August,[9] however, as the heat becomes slightly less intense, production, and with it employment, again increases, stimulated by the demand for lime to be used in plaster. Plastering marks one of the later stages in building construction and consequently the peak demand occurs toward the end of the period of construction activity.

Wall Plaster

Principal products:

> Gypsum plaster and other ready-mixed wall plasters and similar preparations such as hard wall plaster, plaster wainscoting, fiber plaster, stucco, calcined plaster, molding plaster, plaster boards, asphalt mastic, and ornamental plaster work for interior decoration; gypsum and other wall boards; floor composition.[10]

The curve of employment in the manufacture of wall plaster follows closely the curve of employment in the manufacture of lime, although the intensity of the seasonal movements is somewhat smaller. January is the month of minimum employment; a rather rapid increase develops until

[9] *The Statistical Abstract for the United States* of 1930 reports mean temperatures for 57 selected cities well distributed throughout the country. July is recorded as the warmest month in 49 cities. Six cities (all in California or Florida) show the highest mean temperature in August. In two cities July and August have equal mean temperatures.

[10] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 928.

April. The April level is maintained except for a slight decline in July, until August, when employment increases appreciably. September and October show mild declines succeeded by a rapid decrease until January. (Chart XXII.)

The lateness of the peak can be explained by the use of plaster in the finishing of buildings, and the slight decline in July can be traced to the limited supply of raw materials which is due to the slowing up of activity in the manufacture of lime.

Marble, Slate, and Stone Work

This industry embraces establishments engaged primarily in the manufacture of monuments, tombstones, and other marble and stone articles for cemetery use; builders' and plumbers' marble and stone products; other marble and stone work except grindstones, pulpstones, and hones and whetstones; and roofing slate, slate blackboards, and other slate work.[11]

The fluctuations in the number of wage earners in this industry are again reflections of the seasonal activity in construction. Minimum employment occurs in January and is succeeded by a continuous upward movement until September. From September until January the decline is rapid.

The outstanding feature of this employment curve is the lateness of the peak of summer activity. The cause, however, is easy to determine. Marble and stone work are generally ornamental in character and are added late in the construction process. Slate, which is used primarily for roofing, obviously is not needed until the work of construction is well advanced.

The indices for Ohio, which are also shown in Chart XXI, display a rough agreement as to the seasonal pattern, the chief difference lying in the sharp decline in employment in July, which does not appear in the Census indices. This difference may result from two causes: first, sampling, and second, a difference in classification, for the Ohio figures are for stonework only.

[11] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 909.

Structural Ironwork

Principal products:

Balconies, bank fixtures, beams, coal chutes, columns, crane girders, elevator inclosures, expanded metal for lathing and concrete work, fences, fire escapes, fireproof moving-picture booths, gratings, girders, elevator cars, portable steel buildings, and other structural and ornamental iron and steel work.[12]

An inspection of the list of products included in the structural and ornamental ironwork group, shows that the industry is mainly engaged in the manufacture of articles which, though they are in direct demand by the construction industry, are needed most as the buildings approach completion. Hence we find that the seasonal pattern shows the maximum employment from August to October, about the time that building operations are drawing to a close. Minimum employment is found in February and March; this is followed by a gradual increase until the peak is reached.

Glass

This industry embraces all establishments engaged in the manufacture of glass from raw materials, but does not include those engaged primarily in glass beveling, bending sheet glass, engraving glass, making glass labels, staining and ornamenting glass, or making glassware from purchased "blanks." It does, however, cover the reworking of glass when carried on by the same establishment in which the glass is manufactured. The primary products of the industry are: Building glass, comprising window glass, obscured glass, wire glass, and all other building glass; plate glass; pressed and blown glass, comprising tableware, jelly glasses, tumblers, goblets, lamps, chimneys, lantern globes, bulbs for electric lamps, shades, globes, other gas and electric goods, opal ware, cut ware, decorated glassware, tubing, etc.; and bottles, jars, druggists' wares, demijohns, carboys, etc.[13]

Employment in the manufacture of glass shows a change in the amplitude of the seasonal variations. The Census curve shown in Chart XXIII is for the year 1929 and is derived from the projection of a free-hand curve fitted to

[12] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 501.

[13] *Op. Cit.*, p. 896.

the percentage values for each month. A comparison with the Federal Reserve indices does not show the close agreement which was found when the free-hand projection was applied to the cement, and brick and tile industries. There is, however, a general correspondence; the principal difference is that the Federal Reserve indices show a much sharper drop in employment in July and a more rapid recovery after the July drop.

Both patterns show, in general, two periods of inactivity, one in midwinter and the other in midsummer, with periods of activity in spring and fall. The curves are a reflection of the demand for glass in the building trades,[14] the low point in July, when building activity is at its highest, being accounted for by the fact that the intense heat necessary for glass manufacture combined with normal summer temperatures necessitates a curtailment of production if the health of the workers is to be maintained. With the introduction of machinery in glass manufacture during recent years, the human factor has become less of a dominant force in production, and the falling off in employment in July is becoming less severe. With the more complete mechanization of the industry, the July decline will probably become less pronounced and may ultimately disappear.

Chart XXIII also shows the seasonal employment curves for the manufacture of glass in Ohio and Pennsylvania. Both show patterns similar to those of the Federal Reserve and Census curves but of somewhat greater amplitude.

Lumber and Allied Products

The Census classification of lumber and allied products industries may be subdivided into two groups, those manufacturing crude, rough dressed, and finished lumber, in principal demand in the building trades, and those manufacturing

[14] Since 1925 the automobile industries have made increasing demands for glass, which may ultimately change the nature of the seasonal movements, but this factor was relatively unimportant in the years covered by this study.

miscellaneous wooden articles, etc., which fluctuate in response to a variety of demands.

The first group of industries is represented in the following discussion by the two classifications "Lumber and timber products" and "Planing mills," whose combined employment in 1925 totaled 585,327 wage earners. The second group is represented by the six industries engaged in the manufacture of furniture, turpentine and rosin, wooden boxes, coffins and caskets, cooperage products, and turned and carved wood products, with 275,868 workers. These two groups combined include 861,195 wage earners out of 921,145 reported for the "Lumber and allied products" classification as a whole.

Without exception all of the industries in this classification with a sufficient number of employees to be considered in this study show a response to seasonal movements, the extent of which is discussed in the succeeding sections.

Lumber and Timber Products

Under the industry designation "Lumber and timber products" are classified logging camps, merchant sawmills, planing mills,* operated in conjunction with sawmills, veneer mills, and cooperage-stock mills.

The principal products of logging camps are saw logs; shingle, stave, and heading bolts; hewn and round poles; mine timbers; spars; piling; fenceposts; railway ties; and wheel, handle, and excelsior stock. Those of sawmills include rough lumber, shingles, lath, sawed railway ties, and cooperage, spool, pencil, penholder, and veneer stock. The principal planing mill products are dressed lumber, sash, doors, blinds, interior woodwork, and molding.

* Planing mills not operated in conjunction with sawmills are classified separately.[15]

This classification really includes three stages in the manufacture of wood products: (1) the cutting of timber, (2) the rough dressing of lumber, and (3) the finished dressing of lumber. These three divisions of the industry are differently affected by seasonal influences and hence the curve shown is a composite of the seasonals for the three divisions.

[15] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 508.

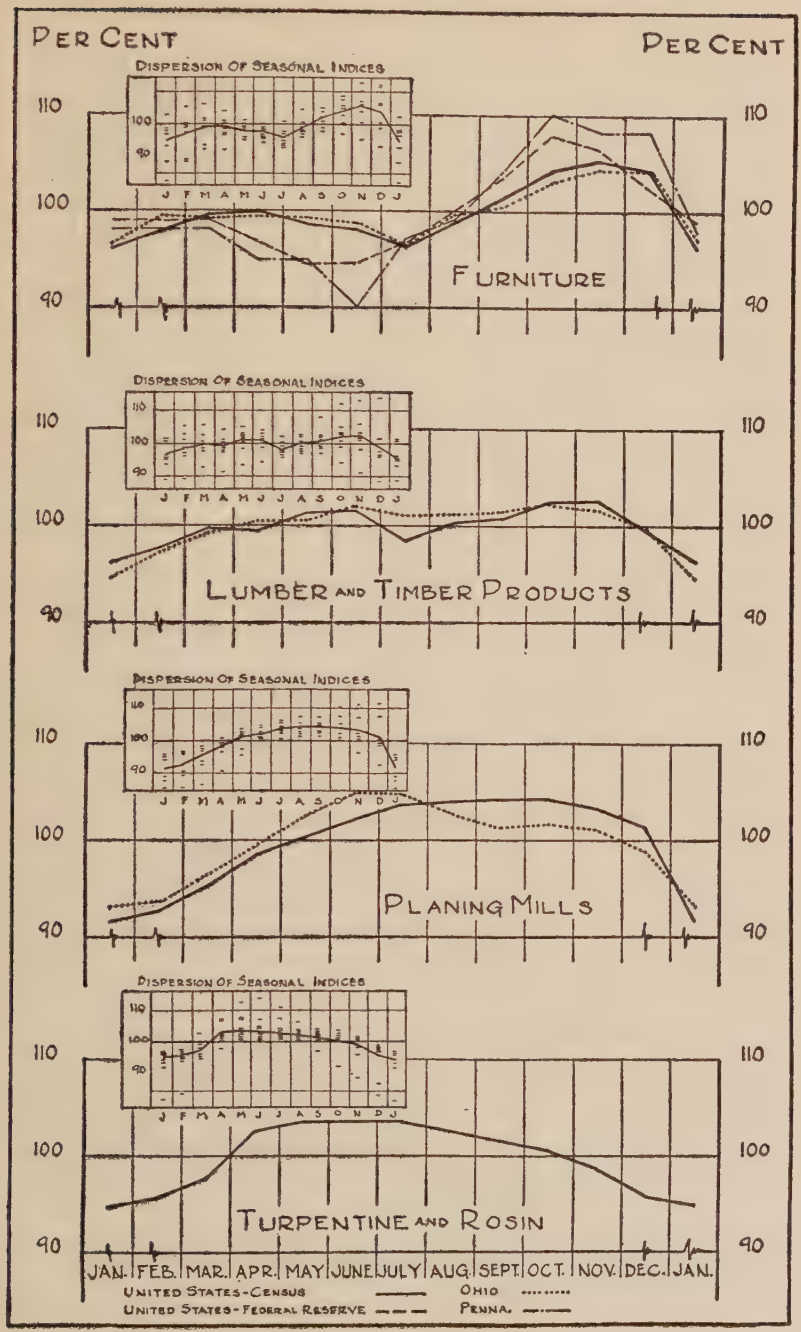

CHART XXIV. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF FURNITURE, AND LUMBER AND TIMBER PRODUCTS, AND IN THE OPERATION OF PLANING MILLS, AND IN THE MANUFACTURE OF TURPENTINE AND ROSIN.

The seasonal pattern for employment shown in Chart XXIV indicates the minimum of activity in January, a condition which results from idleness in the construction industries, which are estimated to consume about seventy per cent[16] of the total amount of lumber produced. In addition to this demand factor, the felling and transportation of lumber is impeded in certain timber sections by the severity of winter weather.

From the low point in January employment expands gradually until June, as a result of the demand by the construction industries for the rougher types of lumber for scaffolding, concrete forms, beams, and similar purposes. July is marked by a slight decline in employment, probably because of the falling off in demand for the rougher types of lumber used in the early construction stages and the absence of a compensating demand for dressed lumber.

In August and from then until November, employment increases as a result of the increased demand of the construction industries for dressed lumber, sash, doors, interior woodwork, etc., which are needed in the finishing of buildings. From the November peak there is a steady decline until January.

In general the amplitudes of the variations are much smaller than those in the other industries producing builders' materials, since there is considerable production to stock which carries the mills along during the periods when demand is slack. For this reason it has been noted that consumption is considerably more seasonal than production.[17]

Seasonal indices for the State of Ohio are also shown in Chart XXIV. These show a general agreement with the Census curve, varying principally in their failure to show the July drop as sharply, a difference which may arise from the nature of the establishments reporting.

[16] This estimate is derived from *Seasonal Operations in the Construction Industries*, p. 165.

[17] See "Planing Mills," p. 129.

Planing Mills

This industry embraces "independent" planing mills, that is, planing mills not operated in conjunction with sawmills. (Planing mills operated in conjunction with sawmills are classified in the lumber and timber products industry.) The principal planing-mill products are dressed lumber, sash, doors, blinds, interior woodwork, and molding.[18]

The products of planing mills are used almost exclusively by the construction industries and hence the seasonal curve of employment in planing mills shown in Chart XXIV results from the seasonal activity in the building trades. Minimum employment is found in January when the construction industries are idle. After January, employment arises steadily but at a decreasing rate until October, and then declines gradually in November and December, with a sharp drop in January. The lateness of the maximum employment is traceable to the use of dressed lumber, sash, doors, etc., in the later stages of building construction.

The employment indices for Ohio, which are also shown in Chart XXIV, agree generally, with the maximum employment in June and July. Such a difference has been noted in most of the construction indices for Ohio and would indicate that the seasonal factors in construction in that state operate at a different time than over the country as a whole.

It should be noted that the curve of employment in planing mills corresponds more closely to the general form for the construction industries than did the employment curve for lumber and timber products. This is probably due to the fact that the classification is more nearly homogeneous in regard to the general uses of its products.

Employment in planing mills also shows a greater amplitude of fluctuations, probably resulting from the absence of compensating types of production which might serve as stabilizers. However, the fluctuations are much less severe

[18] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 550.

than those in the stone, glass, and clay group, because of the greater tendency to manufacture to stock.

Furniture

This industry embraces establishments engaged in the manufacture of furniture of wood, metal, fiber, reed, rattan, and willow.[19]

Employment in the manufacture of furniture is characterized by two low periods, one occurring in January, and the other in July. In the spring, employment increases slightly, just about reaching the average for the year during March and April. After the July minimum, employment increases steadily until November and then once more declines.

Chart XXIV shows curves for Ohio and Pennsylvania as well as the national figures prepared by the Federal Reserve Board and those derived from the Census data. All four curves show a general similarity but there are several points of difference. Between the Ohio indices and the Census indices, the agreement is very close. The Federal Reserve figures, however, give evidence of the spring activity only by the slowing up of the decline from the preceding fall activity. No spring peak is indicated. The Pennsylvania indices agree with the Federal Reserve indices in this respect. In regard to the period of summer idleness, the Federal Reserve figures show the minimum in May, the Pennsylvania figures indicate it in June, while both the Ohio and the Census indices place it in July. In the fall, the Federal Reserve and the Pennsylvania figures show the maximum employment in October, one month in advance of the time indicated by the Ohio and Census figures. These differences can probably be accounted for by differences in the samples on which the indices are based. The close agreement between the Ohio figures and the Census figures is somewhat surprising.

Wooden Boxes

The establishments classified in this industry are those engaged in the manufacture of wooden boxes (not including cigar boxes),

[19] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 564.

crates for butter, fruits, berries, and vegetables; box shooks; cases for eggs and canned goods; carrier trays; storage-battery boxes, etc.[20]

Wooden box manufacture shows a well-defined pattern of seasonality in employment, characterized by a minimum in January succeeded by a steady increase until May. Employment stays at the May level during June and then declines to about average employment in July. With minor fluctuations, the number of wage earners remains close to the average, with a very small peak in October, until November, after which it declines steadily to the January minimum.

Wooden boxes are put to such a variety of uses that an explanation of the seasonal in terms of the demand for them must necessarily be approximate. The spring peak probably arises from a demand for wooden boxes and crates for the shipment of the early fruits and vegetables from the South to the North, a demand which disappears as the northern fruits and vegetables ripen since the latter are shipped usually for short distances only and baskets or hampers are used. The small peak in October appears to result from the demand for boxes to be used for shipping articles for the Christmas trade.

Caskets, Coffins, Burial Cases, and Morticians' Goods

The principal products of this industry are:

Caskets and coffins, whether of wood, of metal, or of other materials; shipping or outside cases; undertakers' supplies and accessories, such as burial garments, robes, shrouds, dresses and suits, shoes and slippers, casket linings and draperies, ambulance baskets, door draperies, lowering devices, trucks, embalming tables and embalming fluids.[21]

In the discussion of the seasonal variations in employment in the "druggists' preparations" and the "patent medicine" industries, it is pointed out that the seasonal movements

[20] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 558.

[21] *Op. Cit.*, p. 580.

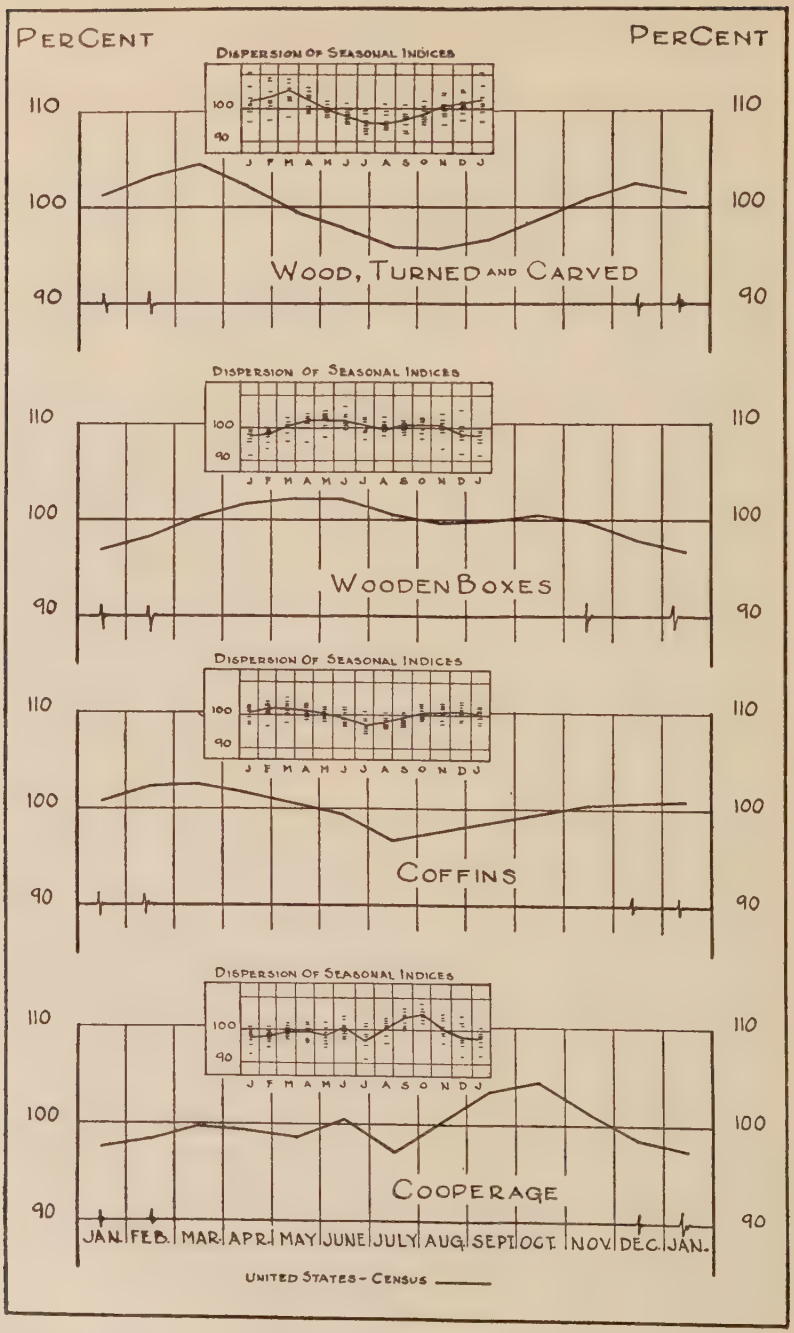

CHART XXV. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF TURNED AND CARVED WOOD PRODUCTS, WOODEN BOXES, COFFINS, CASKETS, AND MORTICIANS' GOODS, AND COOPERAGE PRODUCTS.

there follow, in general, the curve of health.[22] In the manufacture of morticians' goods, employment follows a generally similar pattern. During the winter months illnesses are more frequent and the death rate is higher than in summer; consequently the number of wage earners engaged in the manufacture of caskets, coffins, and morticians' supplies expands during the winter months, when the demand for such products is greatest, and contracts in summer, when the demand is least.

Cooperage

The products of this industry are:

> Barrels, casks, hogsheads, kegs, kits, pails, tierces, tanks, tubs, vats, and similar containers made of staves.[23]

Barrels, kegs, casks, tubs, and similar articles are put to such a wide variety of uses that the seasonal pattern of employment in the cooperage industry, shown in Chart XXV, is difficult to explain in terms of the demand for products. January is the month of low employment and then follows an uneven increase until October. From October to January the decline is rapid.

The seasonal peak in October may be explained by the demand created by the grape and apple harvest for containers for the juices pressed from these fruits.

Wood, Turned and Carved

The principal products of this industry are:

> Bobbins, bungs, brush blocks, dowels, handles, rollers, spools, and other turned wood articles and wood carvings.[24]

Chart XXV shows the seasonal pattern of employment in the industries producing articles of turned and carved wood. Employment shows its maximum in March, which is succeeded by a steady decline to July and August and

[22] See p. 150.
[23] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 580.
[24] *Op. Cit.*, p. 586.

then an increase until December followed by a slight drop in January.

The explanation of this seasonal pattern is to be found in the seasonals of the industries which use the products. Bobbins, rollers, and spools are used mainly in the preparatory processes of textile manufacture and the demand for these articles varies with the activity in those industries. A comparison with the employment curves for cotton manufactures, silk manufactures, and woolens and worsteds[25] will demonstrate the general agreement of the seasonal patterns.

Turpentine and Rosin

> The turpentine and rosin industry comprises the distillation of the semifluid exudation from certain species of pine trees. This exudation is known by various names, as crude gum, crude turpentine, and resin. Relatively small quantities of wood turpentine and wood rosin are obtained from pine wood by steam and solvent extraction and by destructive distillation. Establishments engaged in the production of turpentine, or both turpentine and rosin, in this manner are treated as belonging to the wood distillation industry. . . .[26]

Employment in the manufacture of turpentine and rosin shows a distinct seasonal pattern, the cause of which may be traced directly to the influence of climate on the availability of the raw materials used. Turpentine and rosin are derived by distillation of the sap of certain species of pine. Unless the producer fells the trees and extracts the sap by distillation (a method which is specifically excluded here), the raw material must be obtained by "tapping" the living trees during the periods when the sap is flowing. Hence we find the least employment during the winter months, when the trees are dormant. With the approach of spring and warmer weather the sap in the trees begins to flow and activity in turpentine and rosin manufacture commences. Employment increases rapidly in March and April, and remains at the April level during May, June, and July. By the end of July the flow of sap has slackened, and with the de-

[25] See Charts VII and VIII.

[26] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 574.

creased availability of raw materials, production decreases. Employment falls off gradually from July to October and then drops rapidly to the winter level of inactivity.

Summary

The stone, clay, and glass industries produce materials demanded primarily by the building trades, and hence the seasonality of employment in those industries is very largely a reflection of the irregularities in the activity in construction. The industries least affected are those engaged in the manufacture of glass and pottery; this may be explained by the use of their products in other fields than construction, which exerts a stabilizing influence. Structural and

TABLE 8

RANGES AND AVERAGE DEVIATIONS OF SEASONAL INDICES IN THE STONE, CLAY, AND GLASS, AND LUMBER PRODUCTS INDUSTRIES

Industry	Census		Federal Reserve Board		Pennsylvania		Ohio	
	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.
STONE, CLAY, AND GLASS PRODUCTS								
Brick and Tile Products	20.7	6.0	21.4	6.4	...	...	27.0	8.0
Cement	15.5	4.3	16.2	4.9	5.0	1.5	...	...
Concrete Products	27.0	7.8	...	...	...	...	...	...
Glass	7.1	1.8	9.7	2.6	12.0	2.7	19.6	4.5
Lime	22.4	6.7	...	...	...	...	...	...
Marble, Slate, and Stone Work	23.8	7.2	...	...	...	...	10.3	2.2
Paving Materials	48.0	16.8	...	...	...	...	...	...
Pottery	10.7	2.8	5.7	1.2	...	...	...	...
Structural and Ornamental Ironwork	7.1	2.2	6.3	1.9	...	...	...	...
Wall Plaster	16.3	5.0	...	...	...	...	...	...
LUMBER AND ALLIED PRODUCTS								
Coffins, Caskets, and Morticians' Goods	8.9	2.5	...	...	...	...	...	...
Cooperage	8.4	1.8	...	...	...	...	...	...
Furniture	9.1	2.5	13.5	3.4	20.0	5.0	8.2	1.9
Lumber and Timber Products	6.4	1.4	...	...	...	...	7.6	1.6
Planing Mills	12.7	3.7	...	...	...	...	12.4	3.2
Turpentine and Rosin	8.7	2.9	...	...	...	...	...	...
Wooden Boxes	5.3	1.3	...	...	...	...	...	...
Wood, Turned and Carved	8.9	2.5	...	...	...	...	...	...

ornamental ironwork, which was also included in this group because of its close affiliation with the construction industries, likewise shows a small seasonal range, probably because the products included are used during the later stages of build-

ing, and their installation is less dependent on climatic conditions. Four of the industries in the stone, clay, and glass group give evidence of a progressive change in the seasonal amplitude: brick and tile products, cement, concrete products, and glass. In the case of the first three, the changes could be attributed to three factors: improvement in building technique, standardization of products as to sizes and grades, and educational advertising as to the possibilities, methods, and advantages of winter construction. The changing seasonality in the glass industry is the result of mechanization which has reduced the importance of labor in production and made the summer inactivity less imperative.

The changes in the amplitudes of the seasonal variations were taken account of by fitting free-hand curves to the percentage values for each month, except in the case of the concrete products industry. Here the progressive change approximated a straight line; hence the seasonal values were determined by a least-squares straight line fitted to the monthly percentages for the Census years.

Table 8 shows a comparison of the seasonal ranges and average deviations of the Census, Federal Reserve Board, Pennsylvania, and Ohio indices. In general, the Census indices tend to show a somewhat smaller range of variation than the other indices, as is to be expected in the figures derived from the larger sample. This is not, however, uniformly true. In the marble, slate, and stone work industry, for example, the Census figures show a much wider range than the indices for Ohio, which since the Ohio figures include stone work only may be accounted for by a difference in classification. In the case of pottery, the Federal Reserve Board indices are much lower, which may result from the difference in the time intervals involved.

The lumber industries may be grouped into two classes, those engaged in the handling of raw materials and those manufacturing finished products. In the first group are the lumber and timber products, and the turpentine and rosin industries, both of which show only moderate response to

seasonal influences, in the former case because of the tendency to manufacture to stock, and in the latter because of the duration of the sap-collecting period.

In the finished products classification of the lumber industries, which comprises all the industries but the two just discussed, planing mills are most affected by the seasons. This is due to the fact that their products are used primarily in construction and are therefore subject to an intensely seasonal demand. The other industries in this group are only mildly affected by seasonal factors since their products are largely staples and hence subject to a rather inelastic demand.

As between the Census indices, those of the Federal Reserve Board, and those for Ohio and Pennsylvania, the first tend to show a somewhat smaller range of fluctuation.

CHAPTER VI

THE CHEMICAL, PAPER AND PRINTING, AND MISCELLANEOUS INDUSTRIES

Four of the Census classifications of industries are discussed in this chapter, "Chemicals and Allied Products," "Paper and Printing," "Musical Instruments," and "Miscellaneous Industries." For the most part these classifications include a large number of small industries, so that out of 108 industry designations only twenty-eight reported an average of more than ten thousand wage earners in 1925. Of these twenty-eight industries, four have been discussed in other chapters, the manufacture of buttons, fur goods, and mattresses and bed springs being included with the textile industries, and paving materials, with the stone, clay, and glass products. Five of the remaining twenty-four industries failed to give sufficient evidence of seasonality to warrant the computation of seasonal indices. These were the bookbinding and lithographing industries, the refining of petroleum, the manufacture of coke, and the construction of scientific instruments. Hence the succeeding sections will deal with the seasonal factors in only nineteen industries.

Chemicals and Allied Products

The industries engaged in the manufacture of chemicals and allied products reported in 1925 a total of 245,562 wage earners. The eight industries whose seasonal variations are discussed in the succeeding sections employed 203,934 workers. Only two industries with more than ten thousand workers failed to show conclusive evidence of seasonal movement, the manufacture of coke and petroleum refining, and were therefore excluded.

TABLE 9

SEASONAL INDICES OF EMPLOYMENT IN THE CHEMICAL, PAPER AND PRINTING, AND MISCELLANEOUS INDUSTRIES, BASED ON U. S. CENSUS DATA, 1904–1925

Industry	Average Number Employed 1925	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range	Average Deviation
CHEMICALS															
Chemicals	55,694	103.4	102.2	101.9	100.0	99.2	98.9	98.0	98.2	98.6	99.2	100.1	100.3	5.4	1.3
Druggists' Preparations	9,685	102.1	101.7	101.4	100.4	99.3	98.0	96.9	96.9	99.5	101.4	101.5	100.9	5.2	1.6
Fertilizers	19,644	100.4	126.7	159.3	137.8	89.8	77.0	76.1	82.5	96.2	86.8	83.1	84.3	83.2	20.7
Manufactured Gas	46,998	100.8	98.9	97.8	98.3	98.9	99.4	100.2	100.2	100.2	102.1	101.9	101.3	4.3	1.1
Cottonseed Oil, Cake, and Meal	16,215	137.9	124.4	103.2	71.1	49.8	41.3	38.9	49.8	104.0	160.0	165.0	154.6	126.1	41.5
Paints and Varnishes	25,490	97.6	100.7	103.2	104.7	104.2	102.7	99.2	97.5	97.9	98.6	97.6	96.1	8.6	2.6
Patent Medicines	14,802	102.7	103.8	104.4	102.9	99.9	96.2	95.5	94.9	96.8	100.3	101.4	101.2	9.5	2.8
Soap	15,406	98.8	98.3	100.1	100.0	98.1	98.4	98.0	99.7	102.6	103.5	103.2	99.3	5.5	1.6
PAPER AND PRINTING															
Paper and Pulp	123,842	100.7	101.1	102.1	101.9	101.6	100.6	99.1	98.0	98.8	98.9	98.5	98.7	4.1	1.3
Paper Boxes	57,148	97.5	98.0	99.[illegible]	98.6	97.4	96.9	96.8	97.4	101.1	105.4	106.9	104.8	10.1	3.0
Paper Goods	13,386	97.6	98.8	100.2	100.6	100.0	100.0	98.9	98.0	98.6	101.0	103.0	103.3	5.7	1.4
Publishing and Printing															
Book and Job	133,316	101.4	101.3	101.0	100.0	99.2	98.1	98.3	98.6	99.2	99.6	100.7	102.6	4.5	1.2
Newspapers and Periodicals	117,001	99.8	99.7	100.1	99.7	99.7	99.3	98.3	98.1	99.6	100.9	101.9	102.9	4.8	1.0
Stationery Goods	11,399	99.0	100.7	102.5	102.9	101.8	100.9	98.8	98.7	99.2	99.6	98.2	97.7	5.2	1.5
MISCELLANEOUS															
Fancy and Miscellaneous Articles	14,552	91.5	94.3	95.8	95.7	96.4	96.4	97.7	101.4	106.4	110.4	109.0	105.0	18.9	5.4
Phonographs	11,267	104.8	104.4	103.3	101.4	96.4	91.9	87.5	89.8	97.4	104.3	109.0	109.8	22.3	6.2
Pianos	20,079	97.4	98.3	99.5	99.3	99.4	98.7	95.0	97.2	101.9	103.5	105.0	104.8	10.0	2.5
Signs and Advertising Novelties	15,128	93.5	93.8	95.8	99.8	100.5	100.8	101.1	100.6	101.4	102.8	105.1	104.8	11.6	2.9
Toys, Games, etc	14,162	76.4	83.1	89.2	93.9	98.3	102.1	106.4	109.8	113.1	116.5	113.7	97.5	40.1	10.3

Cottonseed Oil, Cake and Meal

The principal products of this industry are:

> Cottonseed oil, cake, meal, hulls, and linters. Some establishments in this industry also refine the oil produced.[1]

Seasonal variations in employment in the manufacture of cottonseed products are derived from the seasonal characteristics of cotton cultivation. As in the case of other crops (discussed under the manufacture of "Food Products"), the accompanying manufacturing processes depend almost exclusively on the growing and harvesting seasons. Cotton picking begins in late August or early September and continues until the plants are killed by frost, thus ending the crop for the season. Cottonseed products are essentially by-products of the cultivation of cotton for textile uses, and as the cotton is ginned, there is an enormous accumulation of seed to be pressed for its oil, to be made into cake, and to be ground for meal.

An inspection of Chart XXVI shows the maximum employment in the cottonseed industries occurs during the month of November, at the time when the cotton picking season is about over. From this November peak there is an almost vertical decline in employment until May, after which the decline continues until July but at a less rapid rate. In general the curve rises with the accumulation of the seed during the ginning period, and declines as the accumulated stock is exhausted.

Fertilizers

> This industry consists in the manufacture of commercial fertilizers, of which the principal classes are complete fertilizers (mixtures of superphosphates, potash, and ammoniates), superphosphates, and ammoniated fertilizers. It does not include the merchandising of fertilizing materials for use in their natural state, nor of tankage from slaughtering and meat packing establishments for use without remanufacture.[2]

[1] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 855.

[2] *Op. Cit.*, p. 766.

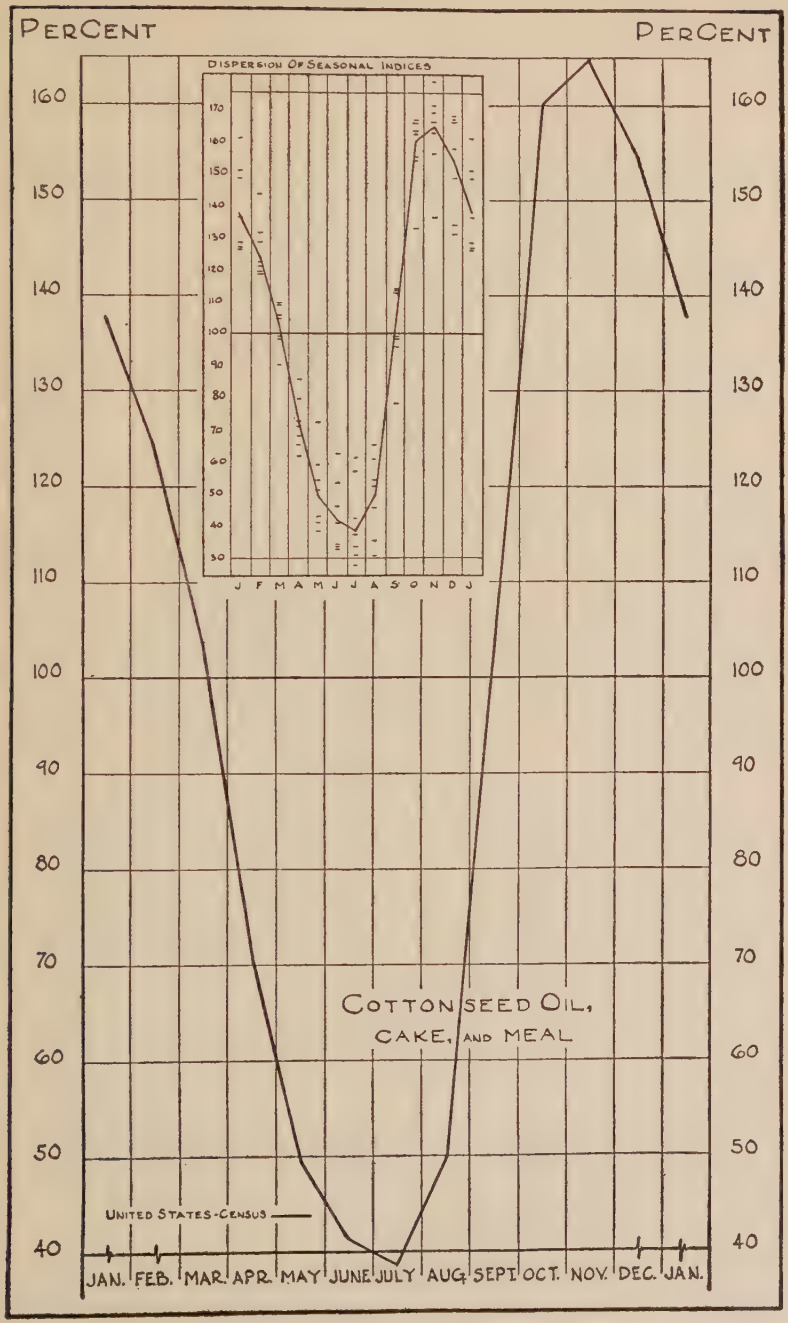

CHART XXVI. INDEX OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF COTTONSEED OIL, CAKE, AND MEAL.

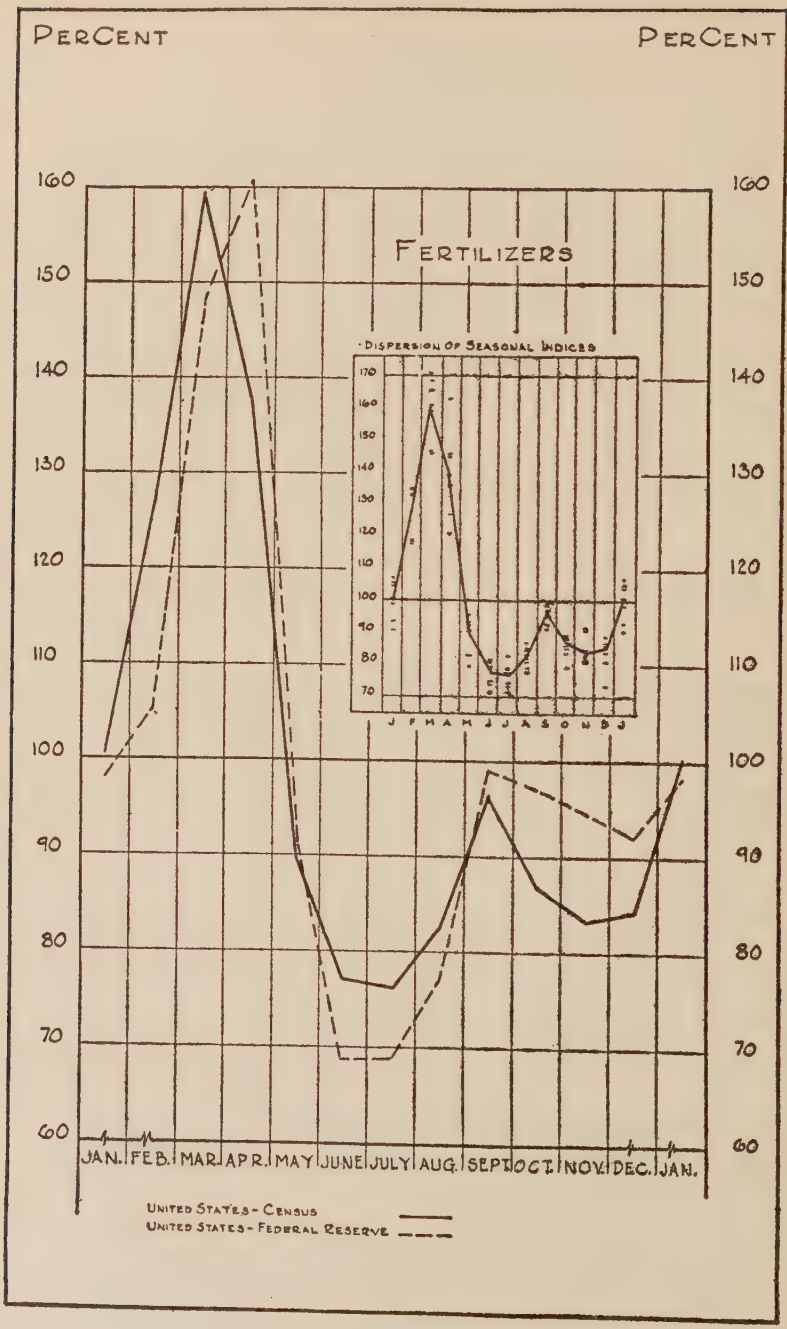

CHART XXVII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF FERTILIZERS.

The causes of seasonality in employment in the manufacture of fertilizers are so evident as to require little discussion. Applications of fertilizer to the soil are made either just prior to or at the time of the planting of crops, and hence we find the maximum employment occurring in March, when the industry is meeting the demand incident to spring planting, and an almost vertical drop to a low point in July. During August and September employment increases rapidly as the industry responds to the demand for fertilizers for the fall planting of crops (the most important of which is wheat), but this increase although large does not pull the volume of employment above the yearly average. After this period of fall activity, employment declines until November, but does not reach so low a point as in July. From the November low the expansion is rapid until the maximum is again reached in March of the following year.

The Federal Reserve indices which are also plotted on Chart XXVII show a pattern generally similar to that traced by the Census figures, but the spring peak is shown in April. This difference may be explained by the fact that the Federal Reserve Board reports this industry as one of changing seasonal; and the curve shown is for the year 1929. An examination of the seasonal indices for the years 1923 to 1926 shows the spring peak in March, with the excess over the month of April declining until in 1927 the April index of employment is higher than the index for March. This movement continued until in 1930 the values of the indices for March and April were almost exactly the reverse of the values for 1923. This change may be due to the generally unsettled conditions among farmers since 1921, which have created an uncertainty as to the amount of fertilizer that may be demanded. Thus the curtailment of advance buying by retailers may have shifted the peak of demand from March until April. If this explanation is correct, the condition is likely to persist until the farmers' position is improved.

Paints and Varnishes

This industry embraces the manufacture of two major classes of products, (a) paints and (b) varnishes, the former comprising colors and pigments (other than bone black, carbon black, or lampblack), paints in paste form, paints mixed ready for use, etc., and the latter comprising varnishes, japans, lacquers, and allied products. The industry can not, however, be divided into two separate branches on this basis because of the fact that many establishments manufacture both paints and varnishes.[3]

The maximum demand for paints and varnishes occurs in the spring of the year, partly because of habit and partly because of necessity. Spring painting is a part of the usual routine of "housecleaning" both domestic and industrial and the custom is firmly established. Moreover, there are factors which make spring painting almost a necessity. Painted surfaces which have been exposed to the action of winter weather are frequently in such bad condition as to demand immediate care. Both wooden and metal surfaces must be treated if the progress of decay or rust is to be stayed. Interior painting may be carried on at any time of the year, but during the winter months, when it is not feasible to open windows for thorough ventilation, the heavy odor of paint is extremely unpleasant if not actually injurious to health.

Hence the seasonal pattern of employment in the paint and varnish industry shows a steady rise from December until April succeeded by a gradual and somewhat uneven downward trend until December, broken only by a slight upward movement (an increase of about one per cent) from August to October. This mild fall activity may be accounted for by the necessity of painting some surfaces before winter sets in.

Chart XXVIII also gives the curve of the seasonal indices of employment for Ohio, which shows a close agreement with the Census curve as to both pattern and amplitude.

[3] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 806.

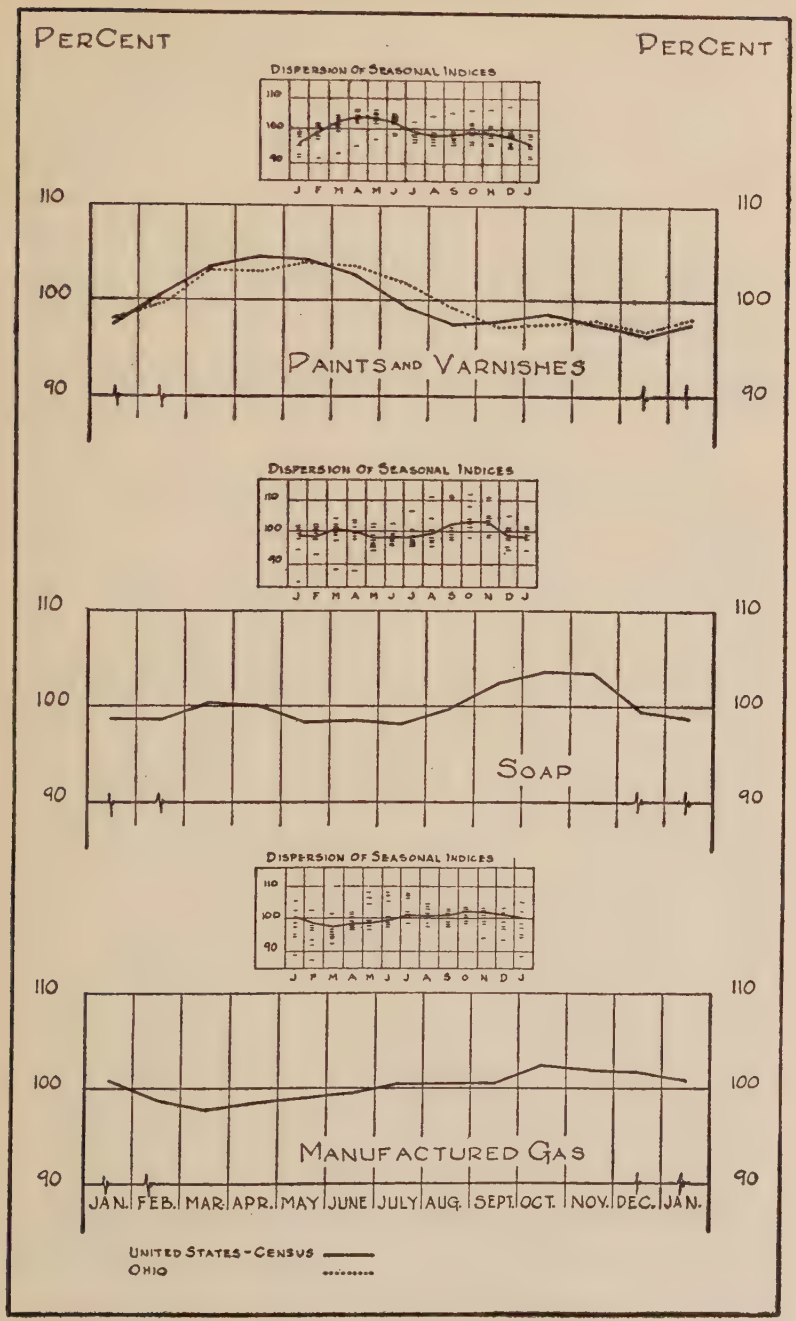

CHART XXVIII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF PAINTS AND VARNISHES, SOAP, AND ILLUMINATING AND HEATING GAS.

Soap

This industry embraces establishments engaged primarily in the manufacture of soap and soap products, together with the soap departments of large slaughtering and meat-packing plants. The chief products are hard, granulated, powdered, soft, paste, and liquid soaps, and special soap articles.[4]

The seasonal pattern of employment in the manufacture of soaps is quite well established in the dispersion diagram of Chart XXVIII but the reasons for this pattern are not easy to determine. The seasonal movements consist of an upswing in August from a summer low to a high point which is maintained throughout October and November, succeeded by a decline until February. There is a mild increase in February and March, after which employment falls off to a low level in June which is maintained throughout July and August.

Chart XXVIII was submitted to a representative of a large soap manufacturing concern for suggestions as to the causes of the seasonal pattern. His suggestion was that the two peaks in the spring and fall were in anticipation of a seasonal demand, occurring in the late spring and at the end of the year, fostered by the intensive advertising campaigns of different companies to boost sales before the closing of the fiscal year, which for the majority is December thirty-first and for others June thirtieth.[5]

Manufactured Gas, Illuminating and Heating

This industry designation covers establishments both private and municipal, engaged primarily in the commercial manufacture of gas to be delivered through mains, for illuminating, household, and industrial purposes, or of Pintsch gas, which is used primarily for lighting railway cars and is delivered direct from the plant to

[4] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 830.

[5] It is interesting to note that the Proctor and Gamble Company have successfully reduced their short-time fluctuations through careful budgeting of production, by regulating deliveries to prevent overstocking by retailers, and by a guaranteed employment plan. It is estimated that production costs have been reduced from three to five per cent.

pressure containers on the cars. Gas produced and consumed within the same establishment, blast-furnace gas, and with a few exceptions, gas resulting from by-product coke-oven operation, are not included as products of this industry. A considerable amount of by-product coke-oven gas is, however, purchased by commercial gas plants and used as an ingredient of manufactured gas.

The products of the gas industry comprise not only the various kinds of gas—coal gas, carburated water gas, mixed coal and water gas, oil gas, and other kinds produced in small amounts—but also the by-products resulting from their manufacture, such as coke, tar, ammonia, naphthalene, and light oil and its derivatives.[6]

The seasonal indices of employment in the manufacture of heating and illuminating gas are based on the Census data for the years 1919, 1921, 1923, and 1925 only. Data were available for the Census years of 1904, 1909, and 1914 but during these years the pattern displayed was almost exactly the reverse of that shown in Chart XXVIII. The seasonal pattern for these early years was marked by a summer peak followed by a gradual decline until February, succeeded in turn by a fairly rapid rise to the summer maximum in June and July.

Since 1919, however, the seasonal pattern has shown a different character; the peak of employment occurs in October and is followed by a gradual decline until March. Between the early years and the late years there is also an appreciable difference in the amplitude of the fluctuations. For the early period, the seasonal range averages 14.9 per cent, but for the years since 1919 the average range falls to 4.3 per cent, with a maximum difference between high and low for any one year (1923) of 6.5 per cent.

Chemicals, Not Elsewhere Classified

This industry embraces establishments engaged primarily in the manufacture of products falling within the 10 groups [acids, nitrogen and fixed-nitrogen compounds, sodium compounds, potassium compounds, alums and other aluminum compounds, bleaching compounds, coal-tar products, plastics and pyroxylin solutions, compressed and liquefied gases, miscellaneous chemicals]. It does not include the

[6] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 776.

preparation of all classes of chemicals in the broad sense of the term, the principal exceptions being (1) sulphuric, nitric, and mixed acids, (2) explosives, (3) fertilizers, and (4) wood distillation products.[7]

The seasonal pattern of employment in the miscellaneous chemicals industries shown in Chart XXIX is characterized by a mid-winter maximum of low amplitude in January and a summer minimum in June, the total range being only 5.4 per cent. The indices computed by the Federal Reserve Board show a close agreement with the Census indices both in form and amplitude. J. F. Dewhurst's indices for Pennsylvania, however, while displaying an essentially similar seasonal pattern, show the peak of employment in March and the amplitude of the movement is somewhat greater. These differences may be explained by a variation in the classifications, the Pennsylvania figures including drugs, patent medicines, perfumery, cosmetics, and soap, in addition to the miscellaneous chemicals.

As to the causes of the seasonal pattern displayed by the Census and Federal Reserve indices, the inclusion of such a wide variety of products, each of which may possess a distinct seasonal of its own, makes their exact determination uncertain.

Druggists' Preparations and Patent Medicines

The "Druggists' preparations" industry embraces those establishments which are engaged primarily in the manufacture of serums, vaccines, and toxins, capsules (filled or empty), tablets, pills, tinctures, medicinal plasters, cough sirups, ointments, and other pharmaceuticals. The principal products of the "Patent medicines and compounds" industry are medicines and compounds sold under the protection of patents, copyrights, or trade marks, or prepared according to secret formulas, including medicines of a proprietary character, not necessarily patented, and various compounds or products handled by the pharmaceutical trade, such as insect powders, corn cures, liver-pads, household ammonia, disinfectants, boiler compounds, fire-extinguishing compounds, etc.[8]

[7] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 710.

[8] *Op. Cit.*, p. 745.

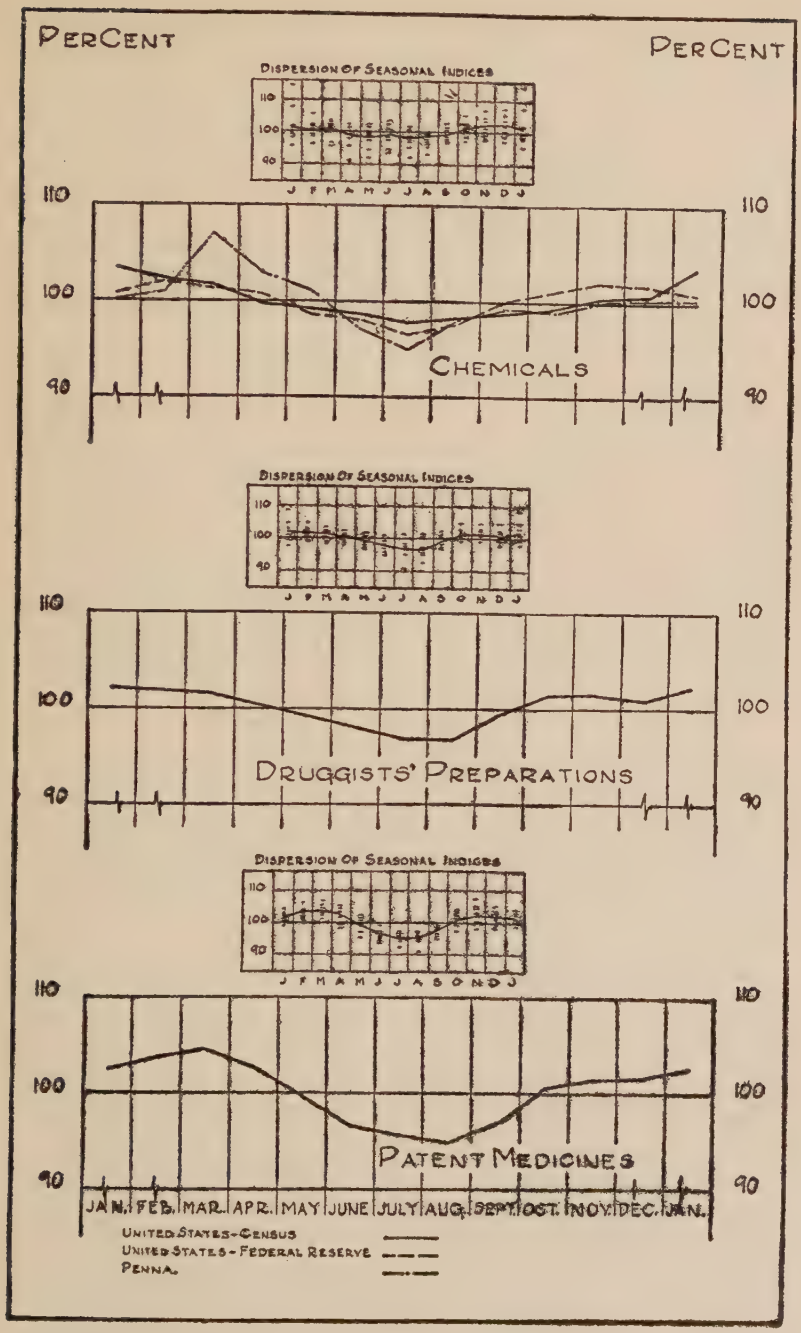

CHART XXIX. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF CHEMICALS, DRUGGISTS' PREPARATIONS, AND PATENT MEDICINES.

The demand for druggists' preparations and patent medicines, follows closely the seasonal curve of health. In general, illnesses are more prevalent during the winter months than in summer, and consequently we find employment in both the "druggists' preparations" industries and in the "patent medicines" industries above average during the fall, winter, and spring months, with a seasonal low which begins in April or May, reaching its minimum in July or August and rising again above average in October.

Paper and Printing

The Census classification "Paper, printing, and related industries" comprises twenty-one separately designated industries of which six reported more than 10,000 wage earners in 1925. Of these six, the industries engaged in lithographing and bookbinding and blank-book making were the only ones in which evidence of seasonal variations in employment was lacking. Seasonal indices were computed for the other four and are presented in the succeeding sections.

Paper and Wood Pulp

> This industry embraces the manufacturing operations carried on in establishments engaged primarily in the production of paper or wood pulp. The statistics are derived from a consolidation of reports made by three classes of establishments—(1) those manufacturing paper exclusively, (2) those manufacturing wood pulp exclusively, and (3) those manufacturing both paper and pulp.[9]

Seasonal fluctuations in employment in the manufacture of paper and wood pulp, show a peak in March followed by a down swing until August. With small variations, employment remains at the August level until December, and then increases until March of the following year.

There may be some question as to the validity of the seasonal pattern presented in Chart XXX since the Federal Reserve Board states that it was unable to find evidence of

[9] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 635.

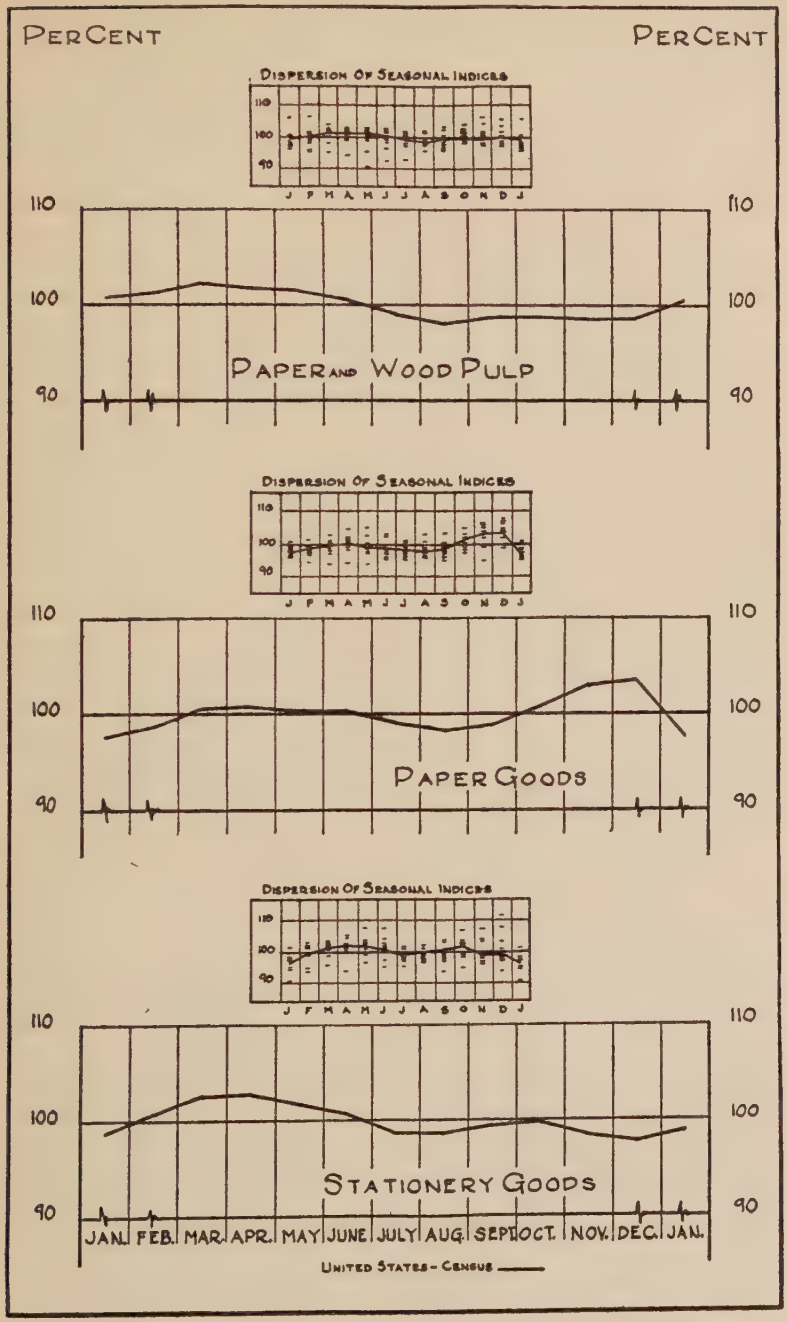
PER CENT
PER CENT
DISPERSION OF SEASONAL INDICES
110
100
90
J F M A M J J A S O N D J
PAPER AND WOOD PULP
DISPERSION OF SEASONAL INDICES
PAPER GOODS
DISPERSION OF SEASONAL INDICES
STATIONERY GOODS
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT OCT. NOV. DEC. JAN.
UNITED STATES - CENSUS

CHART XXX. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF PAPER AND WOOD PULP, MISCELLANEOUS PAPER GOODS, AND MISCELLANEOUS STATIONERY GOODS.

a real seasonal movement. In four of the Census years, the pattern described above was clearly defined, but in 1904, 1919, and 1921, it was obscured to some degree by the cyclical movements. In view of this uncertainty the indices are given without comment as to probable causes of the movements.

Paper Goods, Not Elsewhere Classified

The principal products of this industry are:

> Paper cores and tubes, artificial drinking straws, paper cups and dishes, paper towels, waxed paper, toilet paper, adding-machine and cash-register paper, money wrappers, playing cards, finger-bowl liners, stained-glass paper, etc.[10]

Employment in the manufacture of miscellaneous paper goods shows a regular response to seasonal influences. January is the month of lowest employment, which rises to a slight spring peak in March and April. The later summer months show low employment with a revival in September which reaches its maximum in December.

Again the miscellaneous character of the products precludes a precise determination of the seasonal causes, but the mild spring peak and the December maximum would indicate that to a considerable extent the products are affected by the holiday buying at Easter and Christmas.

Stationery Goods, Not Elsewhere Classified

The principal products of this industry are:

> Papeterie and other stationers' specialties; inkstands, penholders, desk pads, etc.; calendars; copying devices; maps (wall, school, and other) and globes; school supplies, etc.[11]

The seasonal employment pattern in the manufacture of miscellaneous stationery goods is characterized by low employment in January rising to a spring peak in March and April followed by a decline until August. In September and

[10] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 694.
[11] *Op. Cit.*, p. 1189.

October employment increases slightly and then falls off until January.

The fall revival is probably due to the demand created by the reopening of the schools, but the cause of the spring activity is difficult to determine.

Paper Boxes

The principal products of this industry are:

> Shipping containers, both solid and corrugated; set-up and folding paper boxes; cartons; paper pails, cans, and tubes. Decorated tin boxes, lacquered boxes, and textile-covered boxes were reported by some of the establishments.[12]

Employment in the manufacture of paper boxes is characterized by a minor and a major peak with two periods of relatively low employment. In January the number of wage earners is low; in February and March there is a small expansion succeeded by a gradual decline until July. In August employment increases slightly and then rises rapidly to a maximum in November. Following the November peak the decline is rapid until January.

This seasonal pattern is a direct reflection of the seasonal activity in the industries that use paper boxes. Department stores, confectionery manufacturers, and makers of millinery and women's wear are among the principal users of paper boxes. All of these industries reach their maximum activity in the fall months just prior to Christmas and exhibit a secondary period of activity just before Easter. Orders for paper boxes for the Christmas trade are usually placed during the late summer months for delivery during October, November, and December. Paper boxes for the Easter trade are ordered in January and February for delivery just before Easter.

Chart XXXI shows the employment indices for Ohio and Pennsylvania as well as the Federal Reserve indices and those derived from the Census data. The agreement between the four curves is surprisingly close both in the pattern and

[12] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 689.

the severity of the fluctuations, the principal difference being in the somewhat greater amplitude in the curve plotted from the Pennsylvania figures.

Printing and Publishing

> The printing and publishing industry comprises three branches: (1) book and job, (2) music, and (3) newspaper and periodical. Establishments classified in the first branch are engaged primarily in job printing, machine composition for other establishments, book printing and publishing, or book publishing only; those in the second branch, in music printing and publishing, or music publishing only; and those in the third branch, in the printing and publishing, or the publishing only of newspapers and periodicals.[13]

Chart XXXI shows the seasonal indices of employment in two branches of the printing and publishing trade, newspapers and periodicals, and book and job printing. The third branch, music publishing, was excluded since it employed less than ten thousand workers in 1925.

For newspapers and periodicals, the seasonal index curve shows a minimum of employment in August, followed by a steady and gradual rise until December. From December to January, there is a sharp drop to a level which is very close to the average for the year. This level is maintained with negligible fluctuations until June, when it is succeeded by a drop to the low point in August.

This movement is largely attributable to changes in weather conditions which affect demand. During the winter months, when most people spend their hours of recreation indoors, reading is an important form of relaxation. In summer, however, leisure hours are enjoyed out of doors and reading is neglected, with a consequent decline in sales of reading material. The peak of employment in December may be explained by the revival of demand and the increase in the size (number of pages) of both newspapers and magazines brought about by holiday advertising.

The amplitude of the seasonal swings is small, which

[13] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 653.

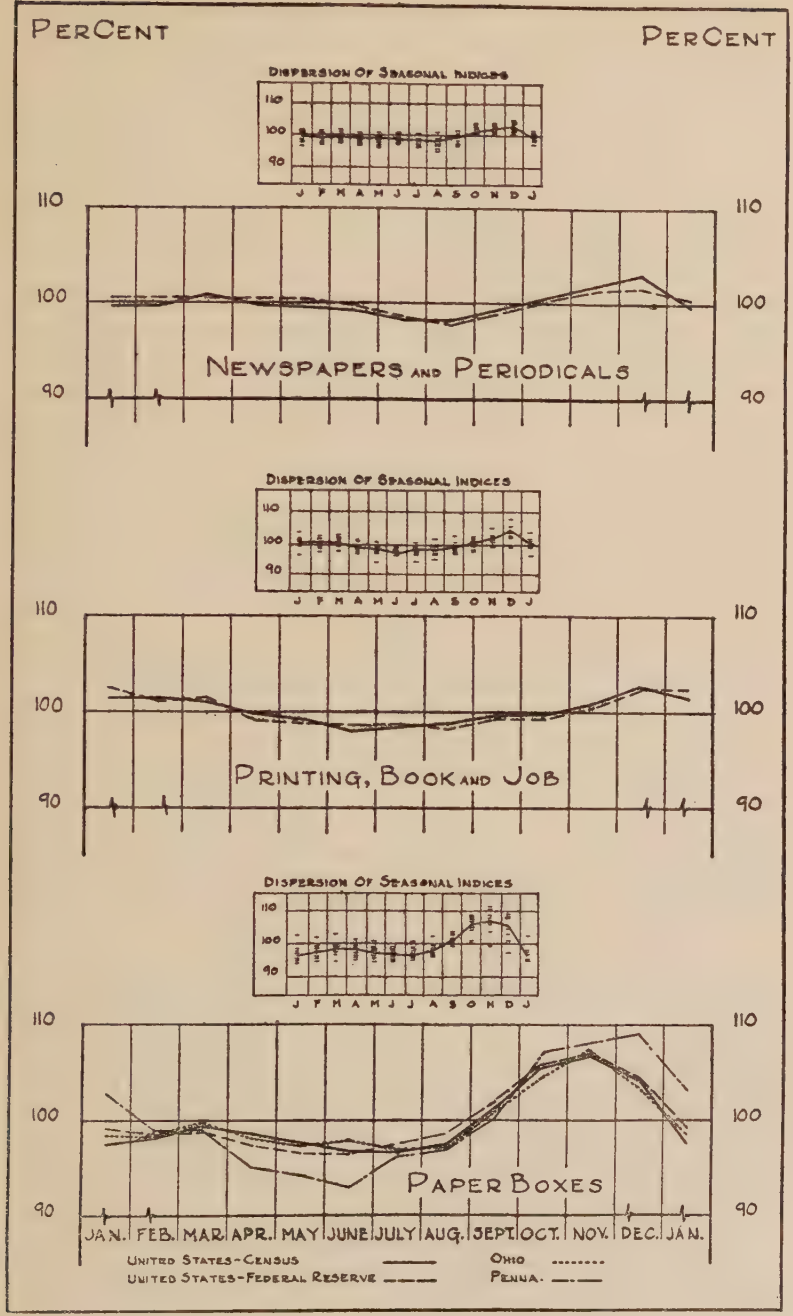

CHART XXXI. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE PRINTING AND PUBLISHING OF NEWSPAPERS AND PERIODICALS, BOOK AND JOB PRINTING AND PUBLISHING, AND IN THE MANUFACTURE OF PAPER BOXES.

results from two factors: first, the large proportion of both magazines and newspapers sold on a subscription basis, which tends to stabilize output, and second, the small effect on newspapers of the change in popular interest to outdoor recreation. News has a year-round appeal which is lacking in fiction, and the close reporting of sports events of widespread interest bolsters up the summer sales.

Seasonal movements in book and job printing are similar to those in the printing of newspapers and periodicals, and result from the same causes, with some minor exceptions. The December peak, for example, is caused not by increased advertising but by the holiday demand for books as gifts. Employment starts to decline earlier in the spring and stays at the lower level for a longer period of time than in the case of newspaper and periodical printing. This difference is probably due to the absence of the stabilizing factor of subscription purchases. Thus we find that while newspapers and periodicals show a slightly greater range of fluctuation (4.8 per cent compared with 4.5 per cent), book and job printing is less stable, and reveals an average deviation of 1.2 per cent, compared with a 1.0 per cent average deviation in newspapers and periodicals.

The Federal Reserve indices of employment in the two branches of the printing and publishing trade are also shown in Chart XXXI. The agreement with the Census-derived indices is very close, both in pattern and amplitude.

Miscellaneous Industries

In the succeeding sections indices of seasonal variations in employment are presented for the industries in the "Miscellaneous" and "Musical instruments" classifications of the Census, but for the industries manufacturing professional and scientific instruments, and optical goods, the nature of the seasonal pattern could not be determined.

Phonographs

Establishments engaged primarily in the manufacture of machines for recording or reproducing speech, music, and other sounds, and

of parts and accessories for such machines are classified in this industry. The parts and accessories include records, blanks, and cabinets, as well as constituent parts of the machines themselves.[14]

The use of and the demand for phonographs and phonograph records reflect very strongly the recreational habits of the public. In summer when outdoor recreations are numerous the demand for phonographs and records is at its lowest. With the return of cooler weather and the resumption of indoor activities, the demand revives rapidly, reaching its maximum in December in the holiday trade. After the Christmas peak, demand declines gradually until warm weather begins in May, when it takes a decided drop to a low point in July.

The seasonal curve of employment shown in Chart XXXII indicates how completely activity in production responds to this seasonal demand.

Pianos

This industry embraces all establishments whose principal products are complete pianos, with or without player attachments. Many of these establishments purchase certain parts and materials, such as strings, plates, keys, keyboards, actions, cases, hammers, sounding boards, etc. from manufacturers classified in the "Piano and organ materials" industry.[15]

Chart XXXII shows the seasonal curve of employment in the manufacture of pianos, and piano parts. The resemblance between this curve and the one for phonographs is marked, the principal difference being that after the peak in December employment in the manufacture of pianos drops below average and stays below until September, while employment in phonograph manufacturing remains above average until May. Once a piano is sold, unless it has a player attachment, it does not give rise to any further demand for the products of the industry. In the case of phono-

[14] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1080.

[15] *Op. Cit.*, p. 1070.

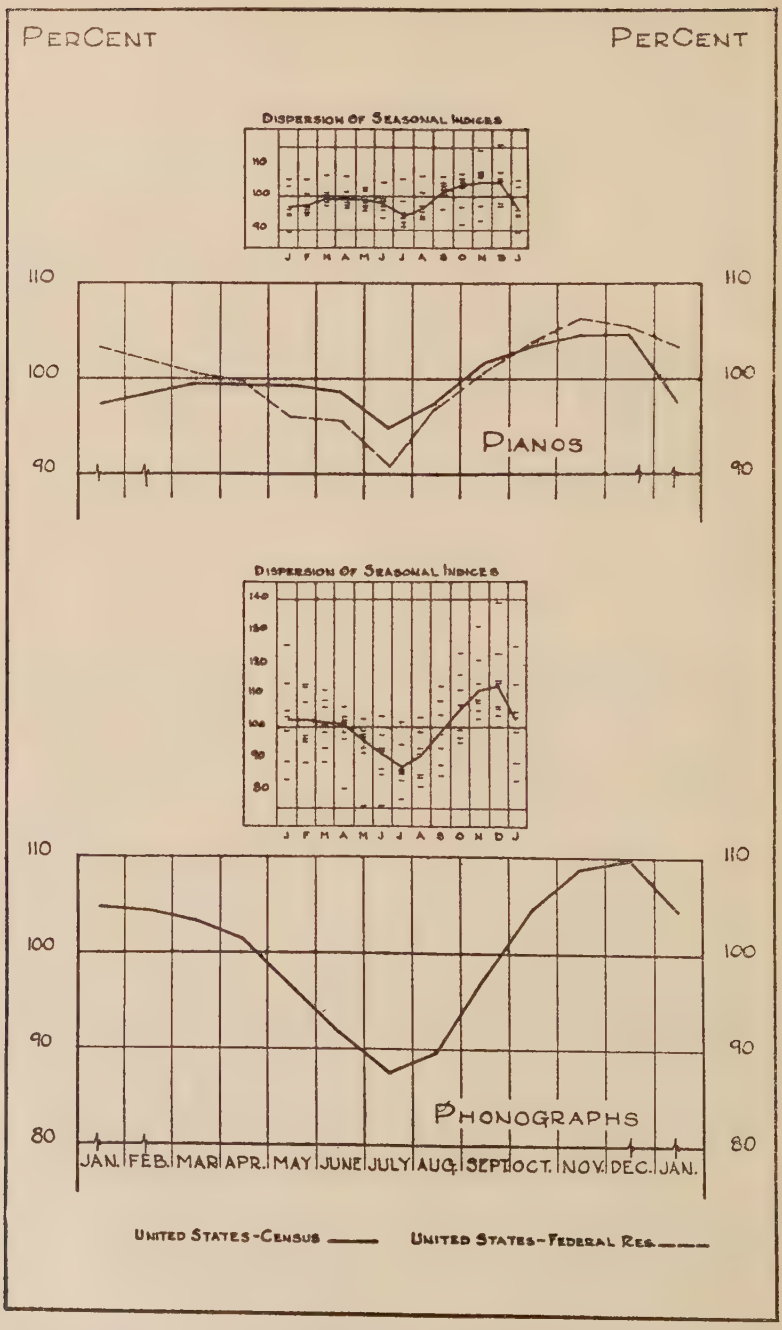

CHART XXXII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF PIANOS AND PHONOGRAPHS.

graphs, however, the sale of one machine creates a more or less permanent demand for records.

Fancy and Miscellaneous Articles, Not Elsewhere Classified

The principal products are:

> A great variety of articles which in a general way may be classed as beadwork; celluloid, metal, paper, and wood novelties; lamp shades other than porcelain or glass; and other fancy articles which cannot be specifically classified in any other industry.[16]

The dispersion diagram accompanying Chart XXXIII shows that the seasonal pattern of employment is well defined. It consists of a high seasonal peak in October, succeeded by moderate declines in November and December, with a precipitous drop from December to January. From January until the October maximum, there is a gradual rise which is somewhat accelerated in the three months before the peak is reached.

With a group of industries as heterogeneous as those classified under "Fancy and miscellaneous articles" any attempt to draw conclusions as to the causes of seasonal movements would be little more than a guess. However, the high seasonal peak in October suggests a preparation for the Christmas trade.

Signs and Advertising Novelties

The principal products are:

> Electric signs; illuminated signs; talking signs; street-car destination signs; painted and decorated showcards; gold-plated, metallic, enameled-wood, and other letters; and advertising novelties such as utensils and conveniences marked with advertising notices. Custom sign painting for offices and stores and on billboards is not included in this industry.[17]

The seasonal pattern of employment in the industries in this classification is well defined, showing a minimum of employment in January and February, followed by a moderately rapid rise until May, after which employment re-

[16] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1175.

[17] *Op. Cit.*, p. 1187.

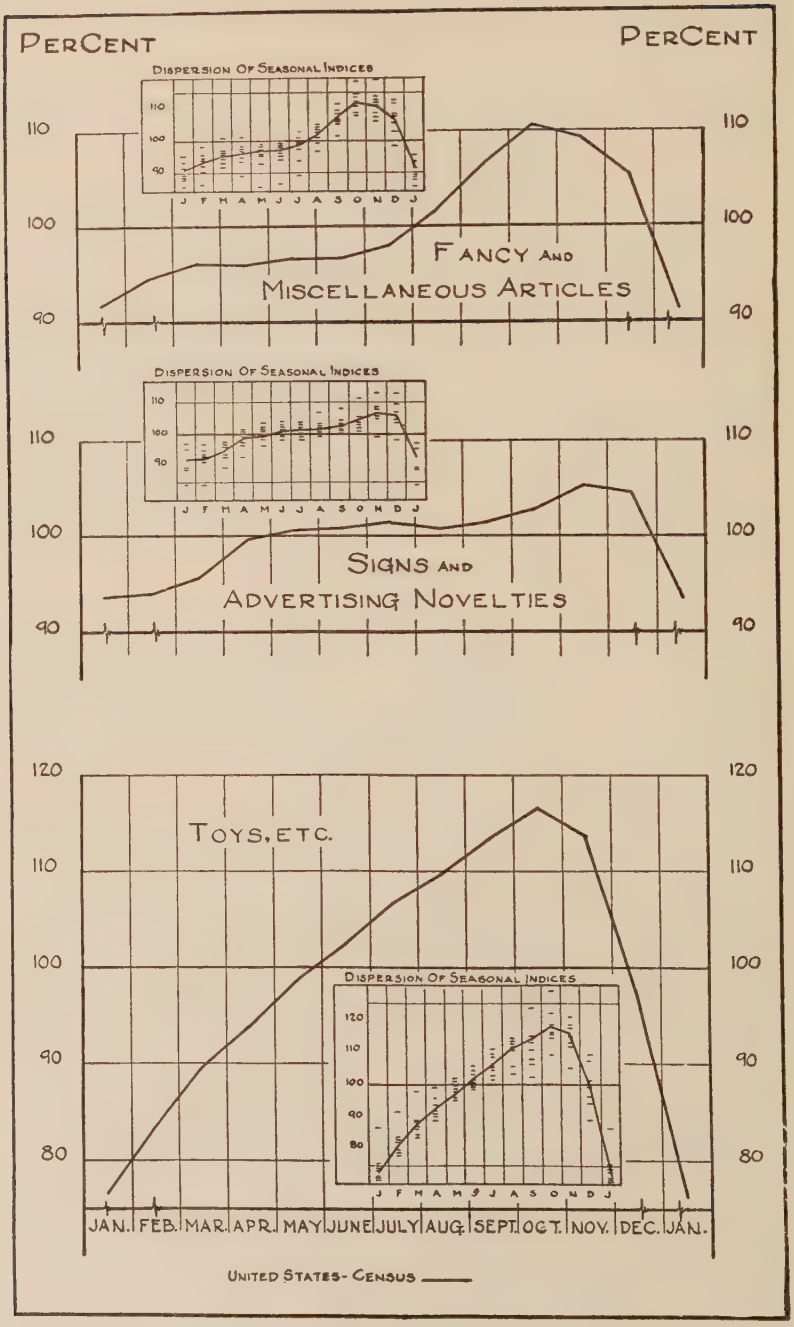

CHART XXXIII. INDICES OF SEASONAL VARIATIONS IN EMPLOYMENT IN THE MANUFACTURE OF FANCY AND MISCELLANEOUS ARTICLES, SIGNS AND ADVERTISING NOVELTIES, AND TOYS, GAMES, AND PLAYGROUND EQUIPMENT.

mains at nearly the same level until September; there is then an upward swing continuing through October and reaching a maximum in November. December shows a slight decrease followed by a sharp decline in January.

With such a heterogeneous classification an exact determination of seasonal causes is impossible, but it is highly probable that the fall peak is created by the large quantity of pre-Christmas advertising.

Toys, Games and Playground Equipment

The principal products are:

> All games for adults except those classifiable under "Sporting and athletic goods, not including firearms and ammunition," and those played with ordinary playing cards; all games for children; playground goods, and lawn swings; toys of all kinds, such as dolls, doll parts, and clothes, toy furniture and utensils, mechanical toys, toy-building blocks, toy drums, hobbyhorses and rockinghorses; kites; conjuring apparatus, tricks, and puzzles; masks; marbles; educational boards; toy balloons; toy pistols, air rifles, etc.[18]

Chart XXXIII shows the seasonal employment pattern in the manufacture of toys and similar articles. It is characterized by a minimum of activity in January, succeeded by a continuous growth to the point of maximum employment in October. Employment declines slightly in December and drops precipitously in January.

The October maximum is obviously due to the preparation for the Christmas trade, while the almost vertical drop in January reflects the almost complete disappearance of demand in the period immediately following the holidays. However, while toy-giving attains its peak at Christmas, it continues in some measure throughout the year as the changing seasons bring demand for toys appropriate to the time of the year. For a brief period after Christmas, children are surfeited with toys, but as the gift toys wear out or break, the demand revives and continues to mount until the following Christmas.

[18] *Biennial Census of Manufactures, 1925*, Department of Commerce, p. 1191.

Summary for Chemical, Paper and Printing, and Miscellaneous Industries

In the preceding portions of the chapter individual industries have been discussed and the more important features of each have been indicated. The following sections present a summary of the generalizations which may be derived from the preceding analyses.

The Amplitudes of the Seasonal Variations

The manufacturing industries discussed in this chapter may be roughly grouped into two divisions, those engaged in the manufacture or preparation of raw materials, or producer's goods, and those producing goods for the final consumer.

The raw materials and producer's goods industries may be further divided into two groups: those which depend on agriculture as the source of their materials, or the market for their products, and those which do not. In the industries which are allied with agriculture, the amplitude of the seasonal variations in employment is very wide, fertilizer manufacture showing a seasonal range of 83.2 per cent, while the manufacture of cottonseed oil, cake, and meal shows a still larger range of 126.1 per cent. This situation is not particularly surprising since agricultural activity must necessarily fluctuate in close agreement with the seasonal fluctuations in climate. It is, however, interesting to note that the fluctuations in the cottonseed industry are more severe than in the manufacture of fertilizer. The former industry depends for the supply of raw material on cotton, which is relatively perishable and must be quickly handled. In the case of fertilizers, the demand may be anticipated, and manufacturing for stock reduces the seasonal range.

In the second division of the raw materials and producer's goods industries there is less dependence on highly seasonal factors of demand or supply, and thus the industries manufacturing chemicals and paper and wood pulp, show rela-

TABLE 10

RANGES AND AVERAGE DEVIATIONS OF THE SEASONAL INDICES IN THE CHEMICAL, PAPER AND PRINTING, AND MISCELLANEOUS INDUSTRIES

Industry	Census		Federal Reserve Board		Pennsylvania		Ohio	
	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.	Range	Av. Dev.
CHEMICALS								
Chemicals	5.4	1.3	5.4	1.6	12.0	2.0	...	...
Druggists' Preparations	5.2	1.6	...	...	...	...	...	...
Fertilizers	83.2	20.7	92.4	19.1	...	...	...	...
Manufactured Gas	4.3	1.1	...	...	...	...	...	...
Cottonseed Oil, Cake, and Meal	126.1	41.5	...	...	...	...	...	...
Paints and Varnishes	8.6	2.6	...	...	...	...	7.3	2.4
Patent Medicines	9.5	2.8	...	...	...	...	...	...
Soap	5.5	1.6	...	...	...	...	...	...
PAPER AND PRINTING								
Paper and Pulp	4.1	1.3	...	...	...	...	...	...
Paper Boxes	10.1	3.0	10.6	3.0	16.0	4.5	10.2	2.7
Paper Goods	5.7	1.4	...	...	...	...	...	...
Publishing and Printing								
Book and Job	4.5	1.2	4.0	1.3	...	...	...	...
Newspapers and Periodicals	4.8	1.0	3.8	1.0	...	...	...	...
Stationery Goods	5.2	1.5	...	...	...	...	...	...
MISCELLANEOUS								
Fancy and Miscellaneous Articles	18.9	5.4	...	...	...	...	...	...
Phonographs	22.3	6.2	...	...	...	...	...	...
Pianos	10.0	2.5	15.5	3.6	...	...	...	...
Signs and Advertising Novelties	11.6	2.9	...	...	...	...	...	...
Toys, Games, etc.	40.1	10.3	...	...	...	...	...	...

tively mild seasonal fluctuations, the stability in both cases being increased by the presence of a wide diversity of demands.

All of the other industries that have been considered fall in the general classification of consumer's goods. Although paper boxes perhaps stand in the middle ground between producer's and consumer's goods, the demand for them is so closely related to consumer's demand that they may be considered in that classification. This group may also be split into two parts, one comprising those industries which manufacture luxuries, and the other, those manufacturing necessities. Obviously it is impossible to make a hard and fast distinction between the two divisions, but for purposes of discussion, druggists' preparations, patent medicines, manufactured gas, paints and varnishes, and soap have been considered the necessities, while the other industries have

been classed as luxuries. As between the two divisions, with but few exceptions, which are readily explained, the greater seasonal amplitude is found in the industries manufacturing luxuries. The paper goods and stationery goods classifications are so heterogeneous in character that the apparent stability is probably due to that cause rather than any inherent permanence of demand. Stability in the publishing and printing industries is due in part to subscription sales and in part to the fact that newspapers and books do not belong strictly in the luxury classification, but approach the status of necessities.

Causes of Seasonal Variations

The same general causes of seasonal variations have been noted in this group as in the other groups studied, climate and custom being the most important.

In the raw materials industries, those which are closely associated with agriculture are affected most strongly by climatic changes, while the others respond to particular seasonal demands for their products.

The consumer's goods industries are more likely to be affected by customs and habits of buying, the variations being intensified by style changes. In some instances (as in the case of books) weather conditions tend to reinforce customs.

Defects of Classification

Again it is necessary to emphasize the deficiencies of the Census classifications. The grouping of industries, which may or may not have similar seasonal movements, does much to conceal the causes of seasonality, and to the extent that the low period in one industry coincides with the high period in another there is a process of cancellation of effects which makes the measures of seasonality distinctly conservative.

CHAPTER VII

SUMMARY AND CONCLUSIONS

I. Causes of Seasonal Variations in Employment

This study has brought to light no new causes of seasonal variations in employment, but has observed the effect of the familiar causes, climate and custom, as they have operated in specific industries.

Climate causes seasonal irregularities for three reasons. First, the basic supply of raw materials in those industries which depend on perishable crops is controlled completely by weather conditions. Hence such an industry as canning is thrown into a state of feverish activity during the harvesting season. Second, the actual process of production is limited by the extremes of heat and cold. Thus the construction industries are idle during cold weather partly because the danger of freezing such materials as cement, concrete, and mortar constitutes a real hazard. And in the glass industries, the heat necessary for production combined with normal summer temperatures is so intense that workers refuse to work during the months of July and August; so that before the introduction of machinery in glass manufacture, there was an almost complete shut-down in glass-making establishments during these months. Third, the demand for finished products reflects the stimulating or depressing effect of climate. The seasonal activity in the manufacture of ice, beverages, and ice cream are excellent illustrations of the effect of a climate-controlled demand. In the clothing industries the spring and fall peaks of activity are due in part to habit or custom, but temperature changes provide also a strong stimulus.

Buying habits and customs are very largely associated with the recurrence of holidays or otherwise established periods

such as Christmas, Easter, "straw hat day," "spring housecleaning time," "vacation times," etc., which have become practically institutionalized. Each of the holidays is responsible for a stimulated demand for certain products. Easter augments the demand for flowers, confectionery, greeting cards, millinery, women's clothing, and countless other articles which are appropriate to the season. The exchange of gifts at Christmas is one of the most important causes of fall activity in many industries. The aura of romance that surrounds a June wedding is responsible in part for the spring demand for articles of silverware, furniture, and household equipment. The closing of the schools in June brings a demand for graduation gifts. Such illustrations could be multiplied almost indefinitely.

The two factors, climate and custom, therefore, are the important causes of seasonal variations in employment. Some writers, however, have included style changes, and the inherent character of novelty goods as causes of seasonal fluctuations. It seems doubtful, however, whether either of these factors should be considered as causes of seasonal movements; rather they should be thought of as factors which affect the intensity of the seasonal movement. In the clothing industries, for example, it is highly probable that the spring and fall peaks of activity would still persist even though clothing were completely standardized. The necessity of a change in the weight of the clothing between winter and summer would assure two peaks of demand. Similarly the spring peaks of production in automobile manufacturing would probably continue even without the changes in models. But unquestionably style changes tend to make the amplitudes of the seasonal movements greater.

So also novelty goods are produced in anticipation of a seasonality in demand but do not create that seasonality. Thus at Christmas new goods put on the market have a greater opportunity of sale, because of generally increased buying on the part of the public. It is true that at times a particular novelty may have a tremendous vogue and its

production be greatly stimulated for a short period, but the continuance of popularity in such cases is uncertain. Seasonal fluctuations have been defined as those variations which recur from year to year, and the expansions and contractions in the production of a novelty are likely to be very erratic. It is probably more accurate to say that novelty goods are strongly affected by seasonal factors than that the novelty character of the goods is responsible for the seasonality.

II. Defects in the Census Data

Throughout the entire discussion of seasonal variations in employment the analysis has been hampered by certain defects inherent in the data.

The first of these is the intermittent character of the reporting. Monthly figures for employment were available only for census years and no information was available as to employment fluctuations in the intervening periods. (a) In so far as seasonal factors remained stable, the determination of the extent of seasonal movement offered no serious problem. (b) When there was evidence of progressively changing seasonal amplitudes the problem became more difficult. It was solved by the projection of free-hand curves fitted to the percentage values for the same month of every year plotted chronologically. A mathematically computed trend might have been used (in fact, straight line trends were fitted in the case of "Concrete Products"), but with as few as seven observations unevenly spaced in time, and with the same method of trend fitting unsuitable for different months, it was felt that little additional accuracy could be obtained by more complex methods. In the cases where free-hand curves were used, the results agreed remarkably well with the values computed by the Federal Reserve Board. (c) Where the pattern of the seasonal movement was changing this defect prevented the determination of the presence of seasonal variations. (d) Where the pattern of their movements was not sufficiently persistent to warrant the computation of seasonal indices, the employment figures of a num-

ber of industries were discarded. This does not necessarily mean that these industries were unaffected by seasonal forces, but only that if seasonal factors were present they were obscured in the years covered by the Census enumerations. If a change in the effect of the seasonal forces were progressively modifying the pattern of an employment curve, it is entirely possible that such progressive alteration could not be distinguished from cyclical manifestations or random fluctuations in data reported intermittently. Hence the indices of seasonal variation which have been presented are for industries in which the pattern has remained stable.

A second defect lies in the classification of industries. In general the groups are too inclusive, comprising many industries which are only superficially similar. One of the best illustrations (there are many others) is the classification "Hardware." The industries under this heading manufacture twelve specifically enumerated types of products which are demanded by as many different trades. Each of these types has a seasonal demand of its own which affects employment in hardware production at different times and in different degrees. To the extent that the individual hardware manufacturers produce all twelve lines the figures given by the census are satisfactory, for within a single enterprise the diversification of products does produce a stability of employment. But to the extent that individual producers tend to specialize, the combination of employment figures for different concerns allows the peak of employment in one establishment to offset the low in another, and creates the impression of a stability in the working force which does not exist. In the more miscellaneous classifications, the seasonal pattern no matter how well defined it may be, is the resultant of a complex set of seasonal factors which have retained their relative importance over a series of years. Hence the seasonal indices of employment, apart from any compensating effect of combining data from different geographic divisions, do not fully measure the importance of seasonal variations even for the country as a whole, but

afford at best a minimum indication of employment fluctuations which are due to seasonal factors.

The miscellaneous character of the classifications also makes an exact analysis of causes of seasonality practically impossible. Seasonal factors which affect the supply of, or the demand for, an individual product may be determined by close investigation, but when products are grouped and the proportion which each contributes to the total volume of employment is unknown (even the value of the products is not a satisfactory criterion), the statement of seasonal causes must necessarily be in general terms.

Despite these difficulties, the Census data provide the most complete description of employment fluctuations which is available. The following sections will be devoted to a summary of the information which the Census has provided.

III. Importance of the Seasonal Range. Summary by Groups

In the preceding chapters, an effort has been made to paint a detailed picture of the nature and extent of seasonal variations in employment as they occur in specific manufacturing industries. In the present chapter the problem will be discussed as a whole without reference to particular classifications.

In the first place, what is the total amount of seasonal variation if the distinction between industries is disregarded? The customary response to such a question would be the presentation of a composite index of seasonal variation for all industries. Such an index number, for example, was constructed by the Federal Reserve Board,[1] and showed a seasonal range from 98.0 per cent to 102.0 per cent. But is this an adequate measure of the total importance of seasonal variations? If so, the whole problem of seasonal irregularities is a minor one. In order to answer this question it is necessary to consider just what is implied by the construction of such an index.

[1] *Federal Reserve Bulletin*, Nov. 1930, p. 663.

Whether the method used is the averaging of the seasonal index figures, or the construction of an aggregate index number, the net effect in the composite is the same: the periods of high employment in one industry may be cancelled by the periods of low employment in another. Let us assume, for example, that a composite index of seasonal variations is to be constructed by using the data for only two industries, and further assume that both industries employ the same number of workers and that their seasonal fluctuations agree exactly in intensity but that the direction of the movements is always inverse. If the data for these two industries were combined month by month throughout the year, the composite index of seasonal variations would show no changes in the volume of employment. In one sense the index is entirely accurate: the total number of workers has remained constant, but as an indicator of seasonal movements it fails completely. Each industry may, in the course of the year, have doubled and then halved its working force, but as long as there is perfect inverse correlation in the seasonal fluctuations of the two industries and the extent of the variations is identical for both, the index is unaffected. Of course, such a perfect inverse relationship would be difficult to find in actual data, but when the seasonal movements in a large number of industries are combined, the cancellation process just described is present to a very marked degree.

The measurement of the total amount of seasonal variation may be viewed from several angles. In the preceding illustration, considered abstractly, there has been a constancy in the volume of employment. From the standpoint of the workers, however, the situation is entirely different. The fact that the seasonal variations of a large number of industries tend to cancel each other in no way decreases the problem of finding new employment when a worker is dropped from the payroll because the peak of seasonal activity is over.

If the worker who is released from one industry finds immediate employment in another at an equal wage, in one

sense he is unaffected by the seasonal movement, for his income continues without interruption, and his economic status is unimpaired. Ability to make such a readjustment, however, is dependent on two factors. First, and perhaps the more important, is the relative geographic position of the two industries. The fact that the automobile industry in Detroit is working overtime at its seasonal peak of activity can afford but little relief to a seasonally unemployed man in New Orleans. If the man were single perhaps such a shift might be made, but if he is married and bound by the obligations of a home, such a change would entail more expense than waiting in idleness for the resumption of activity in his usual occupation, and further he would be faced with the same problem when the seasonal rush in automobile manufacture was past. The second factor is the adaptability on the part of the worker. Few wage earners possess a high degree of skill in more than one occupation; and if the unemployed man in the preceding illustration were an expert weaver, his skill would be of relatively small value in the manufacture of automobiles. If such a change in employment were made, it would be accompanied by a reduction of income, and would probably involve some loss of working time before the shift was effected. Thus from the workers' point of view, although the seasonal index of employment indicates no change the problem of maintaining steady employment is in no way simplified.

From the employer's standpoint seasonal irregularities in employment are matters of dollars and cents. Every employee added to the payroll involves an expense for training, which tends to vary with the degree of skill necessary for the occupation. Every employee dropped from the payroll means a loss of the investment made in the education of that worker. Apart from the losses directly incident to labor turnover, seasonal irregularity of operation creates a heavy burden of overhead. During the slack seasons, considerable machinery and other equipment lie idle. This entails a larger capital investment than would be necessary if production

were stable throughout the year. Hence while the index of employment in our hypothetical case shows no change, both industries have incurred the expenses incident to seasonal labor turnover and the maintenance of idle equipment.

From the social point of view the seasonal index of employment suggests a stability which does not exist, and for the careless user of such an index may imply an absence of unemployment. The extent to which the stability of a seasonal index indicates the presence or absence of unemployment depends on the mobility of labor and the ability of each industry during its seasonal peak to utilize the seasonally unemployed from other industries. Doubtless there is a considerable interchange of employees between industries, but nevertheless it should be kept in mind that it would be possible to have an absolutely stable index of employment with almost any percentage of the total working force regularly unemployed, provided that the seasonal movements of all industries dovetailed perfectly. Hence it may be concluded that a composite seasonal index of employment measures not the total amount of seasonal variations in employment but merely the extent to which the periods of activity and inactivity in different industries fail to cancel each other in the combining process.

There will be no attempt in this study to present a composite index for seasonality of employment, for such a figure would be misleading and would underestimate the importance of seasonal changes. There will be presented, however, figures which it is hoped will give a more adequate indication of the importance of the seasonal factors. The measure that is suggested is a summation of the seasonal ranges for each industry; but before presenting results, it is desirable to consider exactly how this measure may be interpreted, and in what manner it differs from the usual composite seasonal index.

For purposes of illustration, let us take the actual data for two industries (the reasoning applies equally well when all industries are considered): the canning of fruits and vege-

tables, and the manufacture of fertilizers. These two industries are chosen because the peaks of employment do not coincide. Tables 1 and 9 give the seasonal indices for these two industries, which are repeated in Table 11 together with a composite index obtained by taking an average of the per-

TABLE 11

ILLUSTRATIVE TABLE SHOWING CONSTRUCTION OF CONVENTIONAL SEASONAL INDEX OF EMPLOYMENT

Month	Index of Employment in Canning of Fruits and Vegetables	Index of Employment in the Manufacture of Fertilizer	Composite Index Weighted by Average Employment in 1927
January	37.2	100.4	49.0
February	36.5	126.7	53.4
March	39.5	159.3	61.9
April	44.8	137.8	62.2
May	49.8	89.8	57.3
June	85.4	77.0	83.8
July	137.5	76.1	126.0
August	207.1	82.5	183.8
September	248.8	96.2	220.3
October	169.8	86.8	154.3
November	88.1	83.1	87.1
December	55.5	84.3	60.9
Total Range	212.3	83.2	171.3

centages for each month weighted by the number employed in 1927. The cancelling effect of the two indices is apparent in the composite, which has a range of 171.3 per cent.

The *Census of Manufactures for 1927* reports an average of 80,924 wage earners engaged in canning fruits and vegetables and 18,612 in the manufacture of fertilizers. Applying the percentage seasonal range in fertilizer manufacture to the average number employed (83.2 per cent of 18,612) a total labor change of 15,485 wage earners results. In the canning of fruits and vegetables, a similar measure (212.3 per cent of 80,924) shows a total of 171,802. But when the range for the composite is applied to the total employment in both industries (171.3 per cent of 99,536) a figure of 170,505 is obtained, which is smaller than the actual seasonal range for canning alone. If the two absolute seasonal ranges

are added, however, the total of 187,287 really represents the total labor change caused by seasonal variations in both industries. Should it be desired to put this total variation in percentage form, it may be done by dividing the total absolute range by the total number of employees in both industries. In the illustration given it amounts to 188.2 per cent.

This comparison of the results of the conventional method of presenting composite indices for the seasonality of employment, with the results of the suggested method of a summation of the ranges, indicates clearly that the former minimizes the extent of the labor change while the latter expresses it completely.

The groupings of industries which have been employed in the earlier chapters of this study were more or less arbitrarily derived from the broad classifications used by the Census. In the following discussion other groupings have been attempted which it is hoped will clarify the summary picture. Manufacturing industries have been divided into two broad classes, those producing goods in a form available for immediate use by consumers, which have been termed "consumer's goods," and those manufacturing articles which are of use in further production, which have been termed "producer's goods." These designations are common in economic writing and an effort has been made to conform to the usual significance given to these terms. However, with the breadth of the Census classifications, there are a number of industries whose products are used by both producers and consumers. In these cases the industries have been classified as nearly as possible according to the most important uses of their products. Even with this criterion there are a number of borderline cases.

The producer's goods industries in turn have been divided into two classes, raw materials and intermediate goods industries, and the products of the latter group have been further subdivided into textiles and allied products, machinery and metal products, construction materials, and mis-

cellaneous intermediate goods. Table 12 shows these classifications, the data for the number of wage earners in 1927, given in column 1, the percentage seasonal range in each industry, shown in column 2, and the absolute seasonal range in the number of employees, presented in column 3, obtained by multiplying columns 1 and 2. Summations have been made for each subclassification and for the entire table. It should be noted that the percentage values which have been designated as totals are averages of the percentage ranges for individual industries weighted by the number employed in 1927.

The raw materials group shows relatively small ranges of seasonal variation, the exceptional cases being the flour industry and the smelting and refining of copper, the large seasonal range for the former arising from its close dependence on the maturing of the wheat crop. Since the indices for the smelting and refining of copper are perhaps the least satisfactorily established of any which have been presented, too much importance should not be attached to this case.

The textile and allied products division of the industries producing intermediate goods shows the smallest average seasonal range, with the individual percentage ranges closely grouped between four and seven per cent except for the three industries manufacturing bags, buttons, and cordage and twine. These three industries were among the "doubtful" ones in the classifications since their products are used by both producers and consumers. It is probable that the use by consumers will account for the width of their ranges.

The machinery and metal products industries show a considerably wider dispersion of percentage ranges, which vary from 4.7 per cent in the hardware industry to 25.9 per cent in the manufacture of agricultural implements. It is interesting to note that the two industries with the largest ranges are dependent on agriculture for the demand for their products. As will be demonstrated in the subsequent discussions, goods dependent on farming for the supply of raw materials or the

TABLE 12

A Comparison of Seasonal Ranges in Industries Manufacturing Producer's Goods

Industry	Average Number Employed in 1927	Percentage Seasonal Range	Absolute Seasonal Range, Number of Wage Earners
RAW MATERIALS			
Flour, Feed, and Other Grain-mill Products	29,982	12.4	3,718
Lumber and Timber Products	413,946	6.4	26,493
Turpentine and Rosin	37,913	8.7	3,298
Paper and Wood Pulp	123,360	4.1	5,058
Chemicals	50,510	5.4	2,728
Smelting and Refining, Copper	13,924	15.2	2,116
Smelting and Refining, Zinc	11,188	7.1	794
Total for Raw Materials	680,823	6.5	44,205
INTERMEDIATE GOODS			
Textiles and Allied Products			
Cotton Goods	467,596	4.1	19,171
Silk Goods	127,643	4.4	5,615
Woolen Goods	61,790	6.1	3,769
Worsted Goods	92,571	6.8	6,295
Dyeing and Finishing Textiles	73,851	5.0	3,693
Bags	11,164	9.5	1,061
Leather	52,924	4.5	2,382
Cordage and Twine	15,084	12.5	1,885
Buttons	9,642	9.7	935
Total for Textiles and Allied Products	912,265	4.9	44,806
Machinery and Metal Products			
Agricultural Implements	33,346	25.9	8,637
Electrical Machinery	241,566	6.3	15,219
Engines and Water Wheels	54,341	13.3	7,227
Pumps and Pumping Equipment	18,671	7.5	1,400
Typewriters and Supplies	16,681	17.4	2,903
Hardware	47,834	4.7	2,248
Tinware	29,721	18.8	5,588
Tools	25,232	6.0	1,514
Wire	19,866	7.6	1,510
Wirework	21,697	5.9	1,280
Total for Machinery and Metal Products	508,955	9.3	47,526

demand for products are the ones most intensely affected by seasonal factors.

Establishments engaged in the manufacture of construction materials show large percentage ranges except in such

TABLE 12 (*Continued*)

Industry	Average Number Employed in 1927	Percentage Seasonal Range	Absolute Seasonal Range, Number of Wage Earners
INTERMEDIATE GOODS (*Continued*)			
Construction Materials			
Brick and Tile Products	100,972	20.7	20,901
Cement	36,322	15.5	5,630
Concrete Products	17,808	27.0	4,808
Glass	65,825	7.1	4,674
Lime	10,903	22.4	2,442
Marble, Slate, and Stone Work	40,474	23.8	9,632
Paving Materials	19,250	48.0	9,240
Pottery	36,667	10.7	3,923
Planing Mills	96,589	12.7	12,267
Structural and Ornamental Ironwork	52,392	7.1	3,720
Wall Plaster	10,014	16.3	1,632
Gas and Electric Fixtures	10,890	13.2	1,437
Paints and Varnishes	28,061	8.6	2,413
Steam Fittings	42,893	7.0	3,003
Total for Construction Materials	569,060	15.1	85,722
Miscellaneous Goods			
Cooperage	11,455	8.4	962
Wooden Boxes	30,797	5.3	1,632
Wood, Turned and Carved	11,856	8.9	1,055
Paper Boxes	56,398	10.1	5,696
Shipbuilding, Steel	41,962	18.2	7,637
Shipbuilding, Wood	13,052	24.3	3,172
Signs and Advertising Novelties	16,907	11.6	1,961
Cottonseed Oil, Cake, and Meal	18,434	126.1	23,245
Fertilizers	18,612	83.2	15,485
Total for Miscellaneous Intermediate Goods	219,473	27.7	60,845
TOTAL FOR INTERMEDIATE GOODS	2,209,753	10.8	238,899
TOTAL FOR PRODUCER'S GOODS	2,890,576	9.8	283,104

industries as glass, paints and varnishes, pottery, and steam fittings, where other demands than those of the building trades exert a stabilizing influence. The average range for the entire group is 15.1 per cent. Seasonality in the construction industries has already been discussed and its presence is such a familiar phenomenon that further elaboration seems unnecessary.

The miscellaneous intermediate goods industries show an

average range of 27.7 per cent, which is due to the inclusion of the manufacture of fertilizers, and of cottonseed oil, cake and meal, both of which industries are immediately dependent on agriculture. Aside from these two industries, the two branches of the shipbuilding trade have the largest seasonal ranges, resulting from the effect of climate on demand. Other industries in this division show ranges between 5.3 per cent and 11.6 per cent.

For the producer's goods group as a whole, the average seasonal range is 9.8 per cent. Textiles and allied products had the smallest average seasonal range probably because of the diverse uses to which their products may be put and the absence of a close dependence on perishable crops for their raw materials. Raw materials showed the second lowest average range (6.5 per cent), the average being affected by the inclusion of the figures for the copper and flour industries. Machinery and metal products industries had the third lowest range and were followed by the construction materials industries and the miscellaneous groups, the high seasonal factors of which have already been discussed.

The industries engaged in the manufacture of consumer's goods have been classified under two main headings, those manufacturing goods which are subject to an elastic demand and those the demand for whose products is relatively inelastic. Obviously a hard and fast division between these two categories is impossible. Since all goods show some elasticity of demand, the difference is one of degree. The criterion used in classification was the effect that price changes would have on the volume of sales. Those goods were classed as inelastic when an increase or decrease in price would have a relatively small effect on the quantity which could be disposed of. All other goods were classified as having an elastic demand.[2]

[2] It should be noted that the classification of consumer's goods into those with elastic demand and those with inelastic demand rests largely on judgment. The reason for this is twofold: first, studies of elasticity of demand are not available; and second, even if they had been, the breadth and heterogeneity of the census classifications would have made it impossible to use

Table 13 is similar to Table 12 and shows the seasonal ranges for consumer's goods subject to inelastic demand. Within the general classification a four-fold division was recognized: goods dependent on climate; food, drugs, and tobacco; household goods; and miscellaneous articles. Of these four divisions, goods dependent on climate, containing only one industry, stove manufacturing, showed the maxi-

TABLE 13

A Comparison of Seasonal Ranges in Industries Producing Consumer's Goods Subject to Inelastic Demand

Industry	Average Number Employed in 1927	Percentage Seasonal Range	Absolute Seasonal Range, Number of Wage Earners
Goods Dependent on Climate			
Stoves	45,180	21.9	9,894
Food, Drugs, and Tobacco			
Bread	171,995	4.4	7,568
Druggists' Preparations	10,138	5.2	527
Patent Medicines	15,071	9.5	1,432
Tobaccos: Chewing, Smoking, and Snuff	13,125	5.1	669
Cigars and Cigarettes	116,174	7.8	9,062
Total for Food, Drugs, and Tobacco	326,503	5.9	19,258
Household Goods			
Cutlery	17,178	7.7	1,323
Mattresses and Bed Springs	13,481	17.1	2,305
Stamped and Enameled Ware	28,594	7.0	2,002
Total for Household Goods	59,253	9.5	5,630
Miscellaneous Goods			
Coffins, Caskets, and Morticians' Goods	11,665	5.8	677
Gas, Manufactured	48,497	4.3	2,085
Soap	13,432	5.5	739
Printing and Publishing, Newspapers and Periodicals	119,399	4.8	5,731
Miscellaneous Paper Goods	14,837	5.7	846
Stationery Goods	8,987	5.2	467
Total for Miscellaneous Goods	216,817	4.9	10,545
Total for Consumer's Goods (Inelastic Demand)	647,753	7.0	45,327

them. The classifications offered here were submitted to several economists and the groupings presented represent a compromise between their views.

mum seasonal range, amounting to 21.9 per cent. Household goods ranked second with an average seasonal range of 9.5 per cent, which is accounted for by the inclusion of mattresses and bed springs, on the borderline between elastic and inelastic demand. Food, drugs, and tobacco show an average range of 5.9 per cent, and miscellaneous goods, a range of

TABLE 14

A Comparison of Seasonal Ranges in Industries Producing Consumer's Goods Subject to Elastic Demand

Industry	Average Number Employed in 1927	Percentage Seasonal Range	Absolute Seasonal Range, Number of Wage Earners
Goods Dependent on Climate			
Beverages	26,972	43.5	11,733
Canning, Fruits and Vegetables	80,924	212.3	171,802
Canning, Fish, Oysters, etc	12,650	70.2	8,881
Butter, Cheese, Condensed Milk	31,006	31.6	9,798
Ice	22,120	69.0	15,263
Ice Cream	21,927	49.8	10,920
Boots and Shoes, Rubber	26,848	10.5	2,819
Fur Goods	16,640	42.3	7,039
Motor Vehicles	187,910	17.4	32,696
Motor-vehicle Bodies and Parts	181,489	18.1	32,850
Total for Goods Dependent on Climate	608,486	49.9	303,801
Food			
Confectionery	63,163	32.4	20,465
Food Preparations	10,294	18.2	1,874
Sugar	13,996	21.7	3,037
Slaughtering and Meat Packing	119,095	13.9	16,554
Total for Food	206,548	20.3	41,930
Clothing			
Men's			
Men's Furnishing Goods	25,183	12.7	3,198
Men's Clothing	146,099	5.0	7,305
Shirts	57,216	8.0	4,577
Hats, Fur-felt	15,927	13.7	2,182
Total for Men's Clothing	244,425	7.1	17,262
Women's			
Corsets	13,778	8.3	1,144
Millinery and Lace Goods	39,793	26.9	10,705
Women's Clothing	154,459	19.1	29,502
Total for Women's Clothing	208,030	19.9	41,351

TABLE 14 (*Continued*)

Industry	Average Number Employed in 1927	Percentage Seasonal Range	Absolute Seasonal Range, Number of Wage Earners
Miscellaneous			
Knit Goods	190,283	5.0	9,515
Boots and Shoes, Leather	203,110	4.5	9,140
Total for Miscellaneous Clothing	393,393	4.7	18,655
Total for All Clothing	845,848	9.1	77,268
HOUSEHOLD GOODS			
Furniture	186,302	9.1	16,953
Carpets and Rugs	32,829	5.7	1,872
Phonographs	14,216	22.3	3,170
Pianos	16,582	10.0	1,658
Plated Ware	11,752	10.6	1,246
Lamps and Reflectors	10,140	11.0	1,115
Total for Household Goods	271,821	9.6	26,014
MISCELLANEOUS GOODS			
Printing, Book and Job	141,278	4.5	6,357
Jewelry	24,116	11.8	2,846
Clocks and Watches	12,192	5.0	610
Fancy and Miscellaneous Articles	16,965	18.9	3,206
Trunks and Valises	10,345	13.7	1,417
Toys and Games	14,738	40.1	5,910
Total for Miscellaneous Goods	219,634	9.3	20,346
TOTAL FOR CONSUMER'S GOODS (ELASTIC DEMAND)	2,152,337	21.8	469,359

4.9 per cent. The average for the entire group is 7.0 per cent. The outstanding feature of the classification is the uniformly mild reaction to seasonal influences, a characteristic which is to be expected among industries manufacturing essentially staple commodities.

The data for industries manufacturing consumer's goods subject to an elastic demand are given in Table 14. The important feature of this table is the uniformly greater response to seasonal influences than was found among the goods of inelastic demand, the average for the entire former group being 21.8 per cent as contrasted with 7.0 per cent for the latter.

Sub-classifications of the group, however, show marked differences. Goods which are dependent primarily on agriculture and climatic factors have an average seasonal range of 49.9. Within this classification have been included industries which could have been assigned to other groups but which because of the intensity of their movements would have destroyed the significance of the averages for those groups. The food products industries show the second most marked reaction to seasonal movements, but here habits of seasonal buying are the dominating forces, particularly in the case of confectionery products and those articles included in the "Food preparations" classification.

The seasonality in the clothing industries is the smallest dustries show wide dispersion varying from 4.5 per cent in book and job printing and publishing to 40.1 per cent in the manufacture of toys and games. The average for the group is 9.3 per cent.

The seasonality in the clothing industries is the smallest among those industries subject to an elastic demand. The reason for this is to be found in the fact that up to a certain point clothing is a necessity and hence the buying is somewhat stabilized in spite of the disturbing effect of style changes.

As between the major groups which have been set up, industries manufacturing consumer's goods subject to an elastic demand show the greatest fluctuation, while those manufacturing consumer's goods subject to inelastic demand show the least. Producer's goods industries stand in the middle ground.

Table 15 gives a summary for all industries and from this table a concept of the total effect of seasonal variation may be obtained. Of a total of 5,690,666 wage earners, at least 797,790 are regularly thrown out of employment because of seasonal variations in productive activity. From the point of view of the employers considered *en masse* this represents an annual labor turnover of fourteen per cent as a result of seasonal factors.

TABLE 15

SUMMARY TABLE OF SEASONAL RANGES BY GROUPS

Industries	Average Number Employed in 1927	Average Seasonal Range in Percentages	Absolute Seasonal Range, Number of Wage Earners
Producer's Goods	2,890,576	9.8	283,104
Consumer's Goods (inelastic demand)	647,753	7.0	45,327
Consumer's Goods (elastic demand)	2,152,337	21.8	469,359
Total for all industries	5,690,666	14.0	797,790

IV. Relationship Between the Percentage of Female Workers and the Extent of the Seasonal Range

The fact that seasonal variations in employment can occur implies the existence of a secondary labor supply, which may be drawn upon during the busy seasons, and the question naturally arises as to the composition of this supply. It has been estimated that between 1,600,000 and 1,700,000 wage earners are continually unemployed because of seasonal irregularities of operation in industry. These constitute a most important source of casual labor, but there is another section of the population comprising the unemployed women and minors which forms an even larger potential supply. There are no data available for determining the degree to which seasonally affected industries depend upon minors and the seasonally idle, but there are data which may give an indication of the dependence on female labor.

The wage earners in each industry, classified according to sex, were reported in the manufactures division of the 1920 Census. The data for the number of female workers were reduced to percentages of total employment, and these values were compared with percentage seasonal ranges in employment in an effort to determine whether the industries most affected by seasonal influences depend on female labor to a greater degree than the industries less

responsive to seasonal factors. If this greater dependence were established one would expect wide ranges of seasonal variation to be associated with high percentages of female workers and vice versa. Comparisons were made by groups and for all industries but the data failed to give any conclusive evidence that the more seasonal industries depend on female labor to any greater extent than the less seasonal ones with but one exception. Among the industries engaged in the preparation of food products, those with the greatest range of seasonal variation also reported the highest percentage of female workers, but apart from this one case any persistent association of large seasonal ranges in employment with high percentages of female workers, or of low percentages of females with small seasonal ranges was not apparent.

TABLE 16

CORRELATION TABLE COMPARING PERCENTAGE SEASONAL RANGES WITH THE PERCENTAGES OF FEMALE WORKERS

Percentage of Females	Percentage Seasonal Range											
	0–4.9	5–9.9	10–14.9	15–19.9	20–24.9	25–29.9	30–34.9	35–39.9	40–44.9	45–49.9	50 and over	Total
0– 4.9...	1	6	3	5	5	2				1	3	26
5– 9.9...	2	7	1	1	1							12
10–14.9...		2	1				1					4
15–19.9...	2	3	2		1							8
20–24.9...		2	2	2								6
25–29.9...	2	2	2	1								7
30–34.9...		1	2	1								4
35–39.9...	1	3	1						2			7
40–44.9...	1		1								1	3
45–49.9...		1										1
50–54.9...		6		1							1	8
55–59.9...			1									1
60–64.9...	1	2										3
65–69.9...				1								1
70–74.9...		1				1						2
75–79.9...												0
80 and over....		2	1									3
Total...	10	38	17	12	7	3	1	0	2	1	5	96

The food and textile groups reported the largest percentages of women workers, whereas the iron and steel, machinery, lumber, and stone, clay, and glass industries reported very few. Many occupations require characteristics of physical strength and endurance which the average woman does

not possess; hence the presence of women in industry is determined by their physical qualifications for certain types of work rather than by the possibility of using them as a source of casual labor. Table 16, constructed to reveal the relationship between the seasonal ranges and the percentages of female workers, indicates clearly the absence of significant correlation.

V. Relationship Between Average Size of Establishment and Degree of Seasonality

There is a somewhat common belief that large scale production should make for stability of employment. It would follow that industries which operate in large units are less influenced by seasonal forces than those operating in small units.

There are a number of criteria which might be used to measure the average size of the productive units: value of products, volume of goods produced, capital investment, etc.; but in a study of employment, the average number of workers per establishment in an industry offers a reasonably satisfactory criterion. Hence for the purpose of determining the relationship of the size of plant to the degree of seasonality, the average number of wage earners per establishment in each industry was computed for the year 1925 and compared with the percentage range of the seasonal variations in employment.

The results of this comparison failed to demonstrate the existence of any persistent relationship between size of plant and the seasonal range of employment, either within groups of industries or when all industries were considered together, except at the extremes of variation. The only significant conclusion which may be drawn is that no industry with an average of forty employees or more per establishment shows a seasonal range in excess of thirty per cent, and that only two industries with more than one hundred and fifty employees show a range of over twenty per cent. Conversely, it is true that the industries with the extreme ranges of seasonal vari-

TABLE 17

CORRELATION TABLE COMPARING PERCENTAGE SEASONAL RANGES WITH THE AVERAGE NUMBER OF EMPLOYEES PER ESTABLISHMENT IN 1925

Number of Wage Earners per Establishment 1925	Percentage Seasonal Range											
	0–4.9	5–9.9	10–14.9	15–19.9	20–24.9	25–29.9	30–34.9	35–39.9	40–44.9	45–49.9	50 and over	Total
0– 9...	1		1			1	1		2	1	1	8
10– 19...	2	1	1	1	1							6
20– 29...		6	3	3	1	1						14
30– 39...		1	1				1		1	1	4	9
40– 49...		8	1	1	1							11
50– 59...	1	5	2		1							9
60– 69...												0
70– 79...		6	1									7
80– 89...	1	1										2
90– 99...		1	2		1	1						5
100–109...	1	1	2									4
110–119...	1		1									2
120–129...			1									1
130–139...		2		1								3
140–149...	1											1
150–159...												0
160 and over....	2	6	1	6	2							17
Total...	10	38	17	12	7	3	2	0	3	2	5	99

ation all show an average employment per establishment of less than forty workers. Between the extremes, however, a moderately large seasonal is as likely to be found in an industry with many employees as in an industry with few employees, and small seasonal ranges are as common to the small industries as to the large.

VI. SUGGESTIONS FOR FUTURE STUDIES

The present study of seasonal variations in employment has not exhausted all phases of the problem but has been confined to a quantitative analysis of data for the country as a whole within the industry classifications established by the Bureau of Census. Some very important phases of the problem remain to be investigated.

1. Among the principal problems is a quantitative measurement of seasonal variations which will include the effects of part-time employment. In the present analysis the unit used has been the wage earner, but this unit is far from satisfactory. Many establishments, in order to maintain at least a skeleton of their personnel intact, retain workers on a part-

time schedule during dull seasons. Thus a report of the number of wage earners on the payroll for a given day fails to discriminate between full-time and part-time employees. Hence measures of seasonality in employment based on the *number* of wage earners give values which are too high for the slack periods. The ideal unit would be the "employee-hour" but the collection of data in this form would be practicable only from establishments with well-organized accounting systems. Much information, however, could be obtained from an analysis of the fluctuations in amount of the payroll, since part-time employment would be revealed clearly by a reduction in the total amount of wages paid, even though the number of employees remained constant.

The analysis of payrolls leads directly to a consideration of the effects of fluctuations in the volume of purchasing power in the hands of consumers, since the acceleration and retardation of the flow of money reacts directly on the entire system of retail credits and indirectly on the entire credit structure. In times of stringency, a decrease in the amount of purchasing power which flows into the retail trades impedes the liquidation of inventories and thus creates a demand for credit which the financial institutions find difficult to satisfy. It would be desirable to determine the extent to which seasonal fluctuations in payrolls increase the acuteness of the problem.

2. The heterogeneity of the Census classifications of industries has limited the present investigation by obscuring the underlying causes and by minimizing the intensity of the seasonal movements. Future studies should involve the collection of data on the basis of a more logical classification of industries. Such data should be collected and analyzed for small areas as well as for the country as a whole, and occupations within a given industry should be differentiated.

(a) The reclassification of industries would involve splitting up the present industry designations into homogeneous units, so that the action of the seasonal forces could be more accurately observed. The combining of the employment fig-

ures for industries whose seasonal fluctuations are dissimilar gives rise to a cancellation of the peaks and troughs of employment in one industry by the troughs and peaks in another, thus creating a false impression of stability of employment. It is practically certain that an analysis of seasonal variations in employment in terms of homogeneous industrial classifications will show that the actual extent of seasonality is much greater than is indicated in the results of the present study. A further benefit which would be derived from such an analysis would be the simplification of the study of seasonal causes. It is relatively easy to analyze the seasonal factors which may affect the supply of, or the demand for, a single product, but when many different articles are grouped together the problem becomes complex. Both the amount of seasonal variation and the causes must be known if any program for regularization of employment is to be effectively organized.

(b) Geographic or regional differences in the effect of seasonal factors should also be analyzed. The degree to which establishments in the same industry in different sections of the country vary as to the time and extent of their reaction to seasonal forces is unknown. The present study has utilized seasonal indices for Ohio and Pennsylvania to test the similarity of their seasonal patterns to the patterns derived from the Census data. In very few cases has there been *complete* agreement in either the shape of the curves or the intensity of the fluctuations. These differences may be due to several causes. First, they may result from the variations in the size of the samples. Second, they may arise out of real differences in the extent to which seasonal forces affect establishments in the same industry in different localities. Third, seasonal factors may operate at different times of the year in different sections of the country. If the variations noted are due merely to the size of the samples, no further study is needed, but if either or both of the other factors are operating, much information as to the extent and causes of seasonal variations may be obtained through regional studies.

(c) The two preceding suggestions have rested on a concept of seasonal studies by industries, but this might imply that all occupations in a given industry are similarly affected by seasonal forces. In the modern industrial organization it is not uncommon to find the various stages in the productive process, each with its own group of specialized occupations, classified as a single industry. A very pertinent question arises as to whether the various stages in the manufacturing processes are similarly affected by seasonal factors. Hence the breaking down of the industry classifications should be carried beyond the attainment of industrial and regional homogeneity, and an analysis of seasonal variations in employment by productive stages and by the occupations of the wage earners should be carried through.

3. In studying the causes of seasonality in manufacturing employment, much information could be secured by a detailed analysis of the distributive process. It would be most useful to know the necessary time interval between production and retail distribution. Likewise, a detailed knowledge of trade customs among distributors, such as the time of special sales, and special shows of merchandise would be most valuable in determining the cause of the time sequence of seasonal movements.

4. The evaluation of the social and economic consequences of seasonality in employment involves an analysis of the results upon (a) all workers, (b) those who shift employment, and (c) those who remain idle.

(a) All workers are affected in some degree by irregularity of employment. It is desirable to measure exactly (1) the effect on the health of the worker of working at maximum speed, perhaps with overtime, during the busy seasons; (2) the effects of irregularity on the working habits and morale of the wage earners.

(b) It is necessary to determine the extent to which workers released from one industry when the peak of seasonal activity is past find employment in other industries. How much working time is lost in such a shift? What is the effect

upon the income of the worker and how does this affect his ability to accumulate savings?

(c) For those workers who remain idle until the revival of activity in their usual occupations, the problem involves (1) a study of the effect on schemes of unemployment insurance of draining the reserves during periods of seasonal idleness, and (2) an analysis of the extent to which the seasonally unemployed add to the burden of poverty and create a need for social aid.

5. The preceding suggestions for further analysis of seasonal irregularities of employment have implied a search for the harmful effects. However, there is a real question as to whether seasonality should be entirely eliminated or merely reduced. It is quite probable that a certain amount of seasonality is desirable since it affords a really beneficial rest for the workers. The problem is to determine the dividing line between the seasonal movements which are useful and those which are productive of social and economic difficulties.

Data are not now available for the pursuit of the lines of research which have been suggested. All of them will require close investigation and many of them will necessitate case studies. The results of the present analysis throw some light on the wide extent of seasonal phenomena and offer a conservative measure of the size of the seasonal movements, but there is still a broad field for future study.

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APPENDIX

Seasonal Variations for Census Years in Those Industries Displaying a Changing Seasonal Pattern

(Values Read From Free-Hand Curves)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cement												
1904	75.9	80.4	89.4	100.9	106.4	108.5	111.1	109.4	109.4	108.4	103.4	96.8
1909	82.3	84.3	90.8	100.1	104.3	106.3	108.8	107.9	108.4	107.3	102.8	96.7
1914	85.2	87.2	92.2	100.0	102.7	104.7	107.2	107.2	108.2	106.2	102.6	96.6
1919	88.2	88.7	93.2	99.9	101.2	104.4	106.4	106.6	107.2	105.4	102.2	96.6
1921	89.0	89.5	94.1	99.7	101.0	104.1	106.1	106.3	106.6	105.1	102.0	96.5
1923	90.5	90.0	94.2	99.6	100.8	103.9	106.0	106.2	106.1	104.6	101.7	96.4
1925	91.0	90.3	94.4	99.7	100.8	103.9	105.9	106.2	105.6	104.1	101.7	96.4
Concrete Products												
1904	47.0	50.2	64.0	97.7	116.2	129.8	133.6	135.4	136.4	122.2	96.2	71.3
1909	54.1	56.7	69.7	99.1	114.7	125.6	128.4	129.9	130.2	118.3	97.0	76.3
1914	61.0	63.1	75.4	100.5	113.3	121.3	123.2	124.4	124.0	114.6	97.9	81.3
1919	68.0	69.6	81.0	101.9	111.8	117.1	118.0	118.9	117.8	110.9	98.7	86.3
1921	70.8	72.2	83.4	102.5	111.1	115.4	115.9	116.7	115.3	109.4	99.0	88.3
1923	73.5	74.7	85.7	103.0	110.7	113.7	113.8	114.5	112.8	107.9	99.4	90.3
1925	76.3	77.3	87.9	103.6	110.0	112.0	111.7	112.3	110.3	106.5	99.8	92.3
Brick and Tile												
1904	38.3	38.7	57.2	99.4	135.4	147.2	150.2	147.0	138.4	112.9	78.7	56.6
1909	55.1	55.3	69.8	99.3	124.1	135.6	135.6	132.9	125.1	110.3	85.6	71.3
1914	71.3	71.3	79.6	99.5	114.3	121.3	122.3	121.1	116.8	108.1	92.0	82.4
1919	81.5	81.6	87.2	99.4	107.6	112.2	113.6	113.2	110.6	105.7	97.2	90.2
1921	83.8	83.9	89.9	99.5	106.5	110.3	111.7	110.7	108.8	104.8	98.3	91.8
1923	85.3	85.5	91.5	99.5	105.8	109.2	110.2	109.2	107.0	103.8	98.8	94.3
1925	86.6	86.7	92.3	99.6	105.6	108.8	109.3	108.1	106.0	102.9	99.4	94.7
Glass												
1904	110.8	116.1	118.2	117.6	115.9	103.3	44.6	49.5	90.4	104.5	114.0	115.1
1909	108.7	111.4	113.7	112.8	110.3	102.1	58.5	62.5	91.2	104.3	111.4	112.4
1914	106.5	107.3	109.1	108.1	106.0	101.0	72.5	73.1	93.7	104.0	109.1	109.6
1919	104.4	103.3	104.4	103.9	102.4	99.9	83.9	84.9	95.5	103.8	106.5	107.1
1921	103.5	101.7	102.9	102.7	101.4	99.6	88.2	89.0	96.1	103.6	105.4	105.9
1923	102.7	100.2	102.0	101.7	101.0	99.1	91.4	92.2	96.7	103.6	104.6	104.8
1925	101.9	98.9	101.2	101.2	100.9	98.7	94.2	94.5	97.4	103.6	103.7	103.8

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